RAILROAD GAZETTE

FRIDAY, OCTOBER 26.

CONTENTS.

Contributions.

Torpedoes.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The disastrous accident at Shohola on the Erie in August, suggests some thoughts concerning the use of torpedoes. It is the almost universal practice of brakemen to fasten two or more torpedoes to the frame of their lantern by winding the pliable clamp of the torpedo around the rim which protects the globe. The habit is a bad one, because he is not likely to have torpedoes excepting at such times as lanterns are in use, and then if from any cause his light goes out, it is a difficult matter to remove the torpedo quickly. If the lantern should be lost in a wreck, as was the case at Shohola, the torpedoes are lost with it. It has been my practice for many years, either as conductor or brakeman, to have in the pockets of my train clothes not less than four torpedoes. I am as certain that I have them before I go out with a train, as I am that the markers are properly displayed on the rear of the caboose; but I could not use them more sparingly than I do, if I had to pay for them.

The expediency of so carrying was fully demonstrated on two occasions on the New York Division of the Pennsylvania. One night several years ago I was flagman on what was known as the city freight. As we were running (westward) between Deans and Monmouth Junction the train separated into three parts. The night was very dark and there was a long reverse curve between the stations named. The middle brakeman was sitting on the forward car of the middle section, his lantern on the car in front of him. As soon as the train parted he applied the brakes. He could give no signals, and supposed he had all the cars in the rear together. The rear part ran into the middle section with sufficient force to extinguish all the lights in the caboose, but doing no damage to the cars. I knew that the fast Southern freight was following us very close (we used to run under a green signal then [permissive block], and as fast as under a white), because I had flagged her when we took water at East Brunswick. I set two brakes as quickly as possible, and taking the lantern which the conductor had lighted—a white one—I jumped from the caboose. As I struck the ground, the jar extinguished the light. Without waiting to relight it, I ran back as rapidly as possible. When I got to the first curve I placed one torpedo on the rail; at the next curve I put down one more. I could then plainly see the freight coming, but I continued to run toward it until I got to the west end of Deans' siding, fully 1½ miles from my caboose, then I placed two torpedoes on the rail close together to make sure that one would explode, and to make as much noise as possible; then running back about five rail lengths I stopped. When the engine exploded the torpedoes I was in the full glare of the head-light violently signaling with a red flag to stop. As the engine passed me I shouted at the top of my voice—*stop!* My signals had been noticed, brakes had been called for, and the engine was reversed about the time it passed me; as the other torpedoes were exploded I heard repeated calls for brakes and steam being used with engine reversed. They stopped within about ten car lengths of our caboose. Monmouth Junction had reported us to Deans as clear of the block as soon as our engine passed, without waiting to see if our train was together.

It is possible that the head brakeman of the wrecked freight at Shohola did not have time to stop No. 3 in this way; but if he had placed torpedoes on the rail at such intervals as in his judgment seemed best, as he ran toward No. 3, even though he did not have time to stop the train, the engineer, warned of impending danger by the torpedoes, might have so slackened the speed as to have made the collision less disastrous. I do not criticise the brakeman, as the shock of the derailment quite likely affected him so severely as to make any criticism of his conduct unjust; but the possibilities of a case of this kind should be pondered by all brakemen, and I write for their benefit. Emergencies constantly arise on railroads for which no specific rule has been provided; if brakemen when riding over the road would imagine what they would do under certain contingencies, they would be better prepared to act promptly when a few seconds' indecision might cost as many lives.

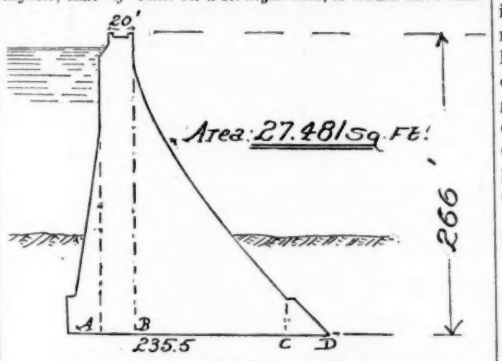
LANGDON.

The Quaker Bridge Dam.

Mr. Arthur Marichal, of Philadelphia, sends us the following letter, which he addressed to the Aqueduct Commissioners on the 16th inst.:

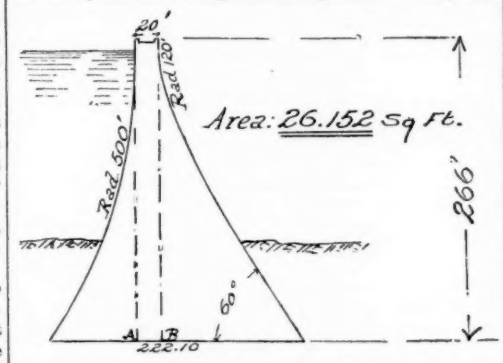
"Having read the report of the Board of Experts appointed by the Aqueduct Commissioners March 7 last, to take into consideration the plan of the Quaker Bridge Dam, I respectfully take the liberty to call your attention to the following facts:

"The report says, in speaking of the profile presented by myself, that '*if built on a straight line*, it would have sufficient strength to resist, for a long time at least, the quiescent pressures; but,' etc. It appears strange that your Board of Experts could be under the impression that the profile was proposed to be built on a straight line, when four pages out of seven of the pamphlet accompanying my profile are devoted to demonstrating that the dam should be built *on a curve in plan*. * * * I wish to say again that the profile I had the honor to present to the Commission is intended to be built on a curve of 900 ft. radius; that this radius is about the smallest one which can be used at the Quaker Bridge Dam, and consequently the one to be selected; that the dam built on a curve of 1,200 ft. radius, as proposed by your Board of Experts, would be considerably weaker, the arch becoming flat. By increasing the radius from 900 to 1,200, the eventual pressure on the voussoir joint would be increased in the same proportion, thus considerably reducing the granular stability of the structure.



Proposed by the Board of Experts.

"Speaking of the profile submitted by myself your Board of Experts says that it would not be entirely safe. I will try to prove that on the contrary it is considerably stronger than the one proposed by your Board of Experts. The main danger in such a high masonry dam is the disintegration of the mortar by an excessive crushing strain near the inner toe. As some disintegration has taken place the water, under the immense pressure resulting from its depth, finds an easy way through the masonry and scours the mortar with rapidity, thus causing a dangerous settling and objectionable counter pressure, having a tendency to decrease the stability of the structure. To calculate the pressure at the base your Board of Experts has made assumptions which can never be realized in practice. They have supposed that the dam was an unyielding mass, consequently more rigid than it would be if made of cast-iron, for instance, while on the contrary we know by experience that rubble masonry yields very much to pressure. The heaviest load will consequently not be at the toes, but will be near to or at *A B* (see accompanying diagram), and that said crushing strain will be about 21 tons per square foot at that place. In the profile proposed by the Board of Experts this maximum pressure will take place *near the inner toe*, while in the one proposed by myself the part *A B*, where the heaviest strain is likely to occur, is *near the centre of the base*, thus avoiding any source of danger. Moreover the calculation made by your Board of Experts assumes the total base to be equally strong, which it is evident that the knife edge *C D* can hardly be relied upon. The calculation, based on the method of Sazilly's trapezoid of pressure, should always be made, but the results should be used only when they give a greater maximum pressure than the one based on the supposition of a yielding mass.



Proposed by A. Marichal.

"Concluding, I would say that (1) the profile designed by myself is strong enough to resist by gravity alone the quiescent as well as the living forces which may possibly act on the dam, and that with ample margin for safety. (2) *When built on a curve of* 900 *ft. radius, as I proposed*, the dam will have an immense margin for safety, and will be stronger than if built according to any of the plans submitted to date by your Board of Experts or others. (3) The area of the section is less than that of any other proposed profile. (4) The dam, built according to my plan, would cost at least $500,000 less than if built according to the plans proposed by your Board of Experts."

[While we do not care to open up a discussion of a subject of but incidental interest to most of our readers, it appears but justice to Mr. Marichal to publish his letter. The Board, in their report, say that the profile *Z* would, *perhaps*, be strong enough *for a time*, if built on a straight line. They also say that in building a dam on a curved plan, the toe pressures are so increased as to render enlargement of the section necessary in order to bring the toe pressure down to the limit allowable. They show that profile *Z*, when built on a straight line, has a toe pressure about 21 per cent. greater than they deem allowable, and a careful examination of the data they give shows that on a curve of 900 ft. radius the toe pressure with this profile would be 33 per cent. in excess of what they consider safe.—EDITOR RAILROAD GAZETTE.]

Steel Rails and Specifications for their Manufacture.*

BY ROBERT W. HUNT.

Having some 20 years experience in trying to make good Bessemer steel rails, and now devoting my thoughts and energies to seeing that other people seek the same end, I venture to lay before the Institute some of the conclusions deduced from my practice and observations.

Those who only know the Bessemer manufacture of today cannot appreciate the many changes which have taken place in steel rail making. The first steel rails used in the United States were imported by the Pennsylvania Railroad Co. from England. The first rolled in this country were made at the North Chicago Rolling Mill from steel made at Wyandotte, Mich., on May 24 and 25, 1865. But this was simply an experimental rolling of six rails. In 1867 some tons were rolled in the Spuyten Duyvil Rolling Mill from steel made at Troy, N. Y. But it was not until August, 1867, when the Cambria Iron Co., of Johnstown, Pa., arranged with the Pennsylvania Steel Co., of Harrisburg, Pa., to roll their steel into rails, their own rail mill not being completed, that the making of Bessemer rails in America was put upon a commercial basis.

As it was my fortune to have charge of the steel department of the Cambria Iron Co. at that time, and having been ever since engaged in rail making, I know the accepted practices of the business from that period, and the difficulties encountered and the measures adopted to either avoid or overcome them. The word steel *then* conveyed a very definite idea to the minds of all men. The character and peculiarities of its behavior under treatment, either hot or cold, were expected to be like tool steel, as that had been observed while under the manipulations of the maker, or afterwards of the smith. And the one thing most earnestly impressed upon every one's mind, and emphasized as the very essence of good workmanship, was, that steel would bear only the most moderate heat. In the converting house all the possible practices of crucible steel teeming were introduced. The ingot molds were carefully brushed out, and heated, and smoked, before being used. When the steel was teemed, all doors and windows of the casting house were closed, etc.; and time was not spared on any of the details. This was the English practice, and we in America followed it.

At first steel rails were rolled in mills which had been designed for iron rails. Other rolls were used, and the number of passes was increased, making the reductions very gradual. But even with these easy reductions, at the low temperature at which the metal was worked, and with the weak machinery, breakdowns were of distressingly frequent occurrence. In May, 1868, A. L. Holley, who then had charge of the Pennsylvania Steel Works, completed and started that company's steel rail mill, it being the first mill in America especially designed for that work. In designing this, Mr. Holley accepted the 21 in. Cambria mill as being the best type of the Fritz three-high mill, and while increasing the diameter of the rolls and otherwise strengthening its parts, largely followed it, even to the general plans.

But steel rails were not immediately accepted as the rail of the future. For a long time the two leading English engineering papers—*Engineer* and *Engineering*—carried on a controversy over the merits of iron *versus* steel rails. And the railroad people suggested early in the day, that if steel rails were to be adopted, they must be obtained at a lower price. But we could not keep on breaking coupling-boxes, rolls, housings and engines, and give our friends cheaper rails, and at the same time make money for our companies. No one dreamed that the business would, in the smallest degree, approach what it has since reached. Had an engineer proposed making the necessary outlay—even had he known how—to build a mill which would have safely handled the metal as then treated, he would not only have been denied the money, but the services of some safer man would have been sought by his prudent and wise directors. To have named $600,000 as the cost of a rail mill would have endangered an engineer's personal liberty. So one day some bold fellow queried: "Can't we get the stuff a little hotter?" It was tried, and a little after a while became a good deal, and that hotter still, until many tons of blooms have been drawn from the heating furnaces with the cinder running off them.

In the early days all blooms were allowed to cool, and were carefully cold chipped before being charged into the reheating furnaces. After the drawing of one heat, and before the charging of another, the doors of the furnace were always raised and the furnace cooled down. Then the heat was brought up very gradually and plenty of time taken to allow the steel to "soak." It was expected to produce but 50 per cent. as many steel as iron rails, and all employés working by the ton were paid twice as much for steel as iron. But the railroads wanted cheaper rails, and more Bessemer rail mills had been built and were building. They were all looking for work, and were desirous of meeting the views of their friends, the consumers. The Bessemer managers were not asked if they could, but were told: "You must manage to lessen your costs, and by all means get out more product." Truth compels me to say that they did not need much urging on this last point.

In 1876 I had the honor of presenting to the Institute "A History of the Bessemer Manufacture in America." In it I endeavored to tersely tell of the rapid changes which had occurred in the art up to that time. And it is not necessary to repeat them; sufficient to again say that in all its branches they came very rapidly, and have not yet ceased. Remember, during all this time the makers have been trying to make good rails, all harassed beyond measure with every complaint, and seeking most earnestly to obviate them. But let the complaint be never so loud, the seller offering rails at

* A paper read at the Buffalo meeting of the Institute of Mining Engineers, Oct. 2-6.

25 cents per ton less would, as a rule, take the order. Such has been the history of the business.

When steel rails were first put down, the railroad traffic had increased to so great an extent, and the quality of iron rails had so fallen off, that it was impossible for the roads to keep up their tracks. The results from the first steel rails were so wonderful that, as a rule, no very careful records of their wear were kept. After a time this was changed, but by that time the "lame ducks" had been eliminated, and we had "the survival of the fittest." The poorest had yielded results so much beyond those obtained from iron rails, that their failure had not caused much comment. But when the record period was reached, every failure caused a shock of horror, and the question was asked: "Why can't you make rails like the early ones?" While claiming that injustice has been done later rails, at the same time I acknowledge many of them have not been as good as the best of the earlier ones.

I have candidly admitted some of the changes on the part of the makers. How has it been on the part of the consumers? The weight of engines and car, speed of trains, and amount of traffic, have been added to. How much? The railroad engineers and managers have been spurred on by the same character of questions as their brethren of the Bessemer faith. "Can't you give us cheaper service and greater tonnage?" They have also answered every time, "Yes."

If rails costing $30 per ton do not last as long as those which cost $125, and at the same time bear many times the annual tonnage, how great is the proportionate loss to the purchaser?

But no one desires to turn backward. The conditions being as they are, the duty of all parties is to work in harmony, and drawing conclusions from the experiences of the past, seek to produce rails which will yield fair service under the present requirements without greatly increasing their cost.

The first duty falls upon the railroad engineer in designing his section. If that is bad, the steel maker will be heavily handicapped in trying to furnish a satisfactory rail. I suppose it is hopeless to even expect the adoption of standard sections. We are seemingly no nearer it than when A. L. Holley read his admirable paper on that subject at the Philadelphia meeting of the Institute in 1881, *Transactions*, Vol. IX. I will not, therefore, at this time venture to submit any designs, and feel tempted to leave that duty to some one with the bright hope of youth imprinted upon his brow. But I will say that I am fully convinced great mistakes have been made in the designs of the heavier sections. And I believe that the unsatisfactory results obtained from many of them have been primarily due to the proportions of the rails. One of the most prominent chief engineers of the country said to me not long ago that he supposed his road would lay 80-lb. rails next year, but he was at a loss what section to adopt, for if their 80s gave as much poorer service as compared with their 65s, as the latter had in relation to their 60s, he guessed they would have to adopt a 90-lb. rail for the following year.

This states it broadly, but it is a generally admitted fact that the increased sections have, as a rule, been disappointing in their wear. I am convinced that this has been largely the fault of the sections themselves. Increased weight of rolling stock, greater speed, augmented traffic, etc., demand heavier and stiffer rails.

The exhaustive experiments of O. Chanute, presented to the Institute in 1881 (*Transactions*, Vol. IX.) demonstrate the rapid augmentation of the crushing strains as the wheel weight is increased. He found "11,000 to 12,000 lbs. weight upon a locomotive driving wheel of about 5 ft. diameter, the pressures were generally 35,000 to 40,000 lbs. to the square inch, although they occasionally ran much beyond this, but with 14,000 lbs. on a driver, the pressures became from 50,000 to 86,000 lbs. per square inch, or beyond the elastic limit even of steel. Under empty freight cars, with, say, 2,400 lbs. on a 33 in. wheel, the pressures were generally 20,000 to 30,000 lbs. per square inch, but with a car loaded with 11 tons, increasing the weight to, say, 5,150 lbs. per wheel, these pressures became about 35,000 to the inch, while if the car was loaded with 20 tons, thus giving 7,400 lbs. to the wheel, the pressures increased to 50,000 or 60,000 lbs. to the square inch." He said then: "As we increase the weight upon our cars, therefore—and I believe this to be the correct and inevitable practice—we must be prepared to find our steel rails wear out faster than they hitherto have done."

But is depending principally upon increasing the depth of the metal in the heads of the rails the proper way to meet this condition of things? One reason given for increasing the depth of metal in the rail head has been the provision of more metal for more wear. But is this economy realized? When a given amount has been worn off the rail is so rough it must come out of the track.

The larger the mass of metal when finished the hotter it will be, providing the same length of time has been spent in putting it into shape. And every steel maker knows the effect of cold finishing. I mean by this, having the steel at a low temperature when the final reductions are made. The smaller the section rolled on a given mill the deeper will the effect of the compression of the rolls penetrate and finer will be the grain of the steel.

I would favor increasing the width of the head more than its depth.

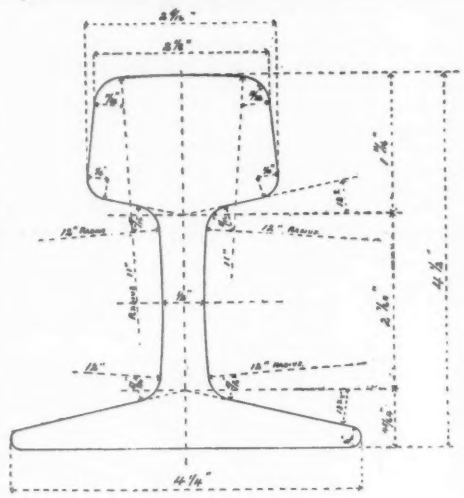
As brittle rails must be avoided as well as rapidly wearing ones, the engineer when designing his rail must not lose sight of the importance of distributing his metal so as to avoid as far as possible cooling strains.

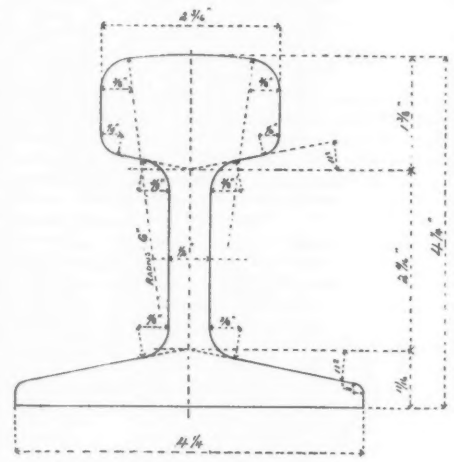
As before stated, I do not now propose presenting *my* ideal rail section. But as supporting my position against deep heads, rolled in existing mills in the ordinary manner, I give two sections. The first, a 65-lb. rail, which is represented by many thousands of tons now in service, and which has been represented by many other thousands of tons whose days of usefulness are over. Not that these rails can be said to have failed, but they have not given the service expected when the design was adopted. The second section is that of a 60-lb. rail which has been in the tracks of one of the roads, using also the first section, for many years, and insists upon remaining there to witness the coming and departure of the "big fellows." I may be wrong, but *these* appearances seem to be on my side. But my conclusions are not formed from this single case. They are based upon the observations of many years.

In discussing Dr. Dudley's paper, *Transactions*, Vol. IX.,[1] in 1881, I called attention to the fact that rails of the closest chemical composition differed widely in wear. In fact one of Dr. Dudley's best, No. 902, and one of his poorest rails, No. 903, were chemically practically the same, but the best was a rail of round and shallow head, the other a deeper headed pattern. As these so fully sustain my position, I give them with their history.

"No. 902, steel of 1871, was on high side of 5-deg. curve, north rail, north track, in Gables Cut, near Summerhill. In service from August, 1871, to July, 1879, 7 years 11 months. Grade, 39.6 ft. to mile. Tonnage, 40,061,230 tons."

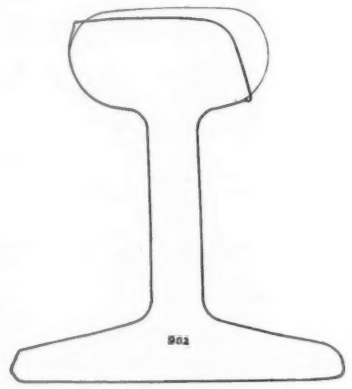
"No. 903, steel of 1876, was on high side of 5 deg. curve, south rail, south track, west of bridge No. 1, Summerhill. In service from August, 1876, to July, 1879, 2 years 11 months. Grade, 39.6 ft. to the mile. Tonnage, 21,504,824 tons."

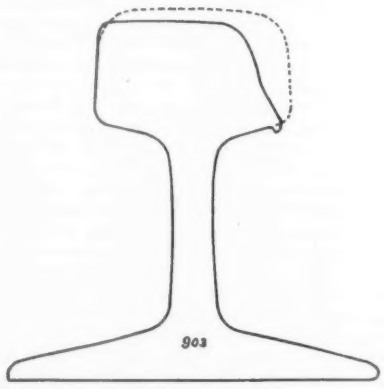




Their analyses were as follows:

	No. 902.	No. 903.
Carbon	0.322	0.355
Silicon	0.026	0.029
Phosphorus	0.077	0.108
Manganese	0.492	0.490





We will assume the section selected to be the best possible; it now remains for the maker to furnish a good rail rolled to it. The character of the permanent way of the railroads of the United States is improving each year. Consequently the demand that the mills shall deliver their rails well finished and straight in all directions is much more imperative than in the past. Of course, absolute accuracy in so gross a product is both unnecessary and impossible, but practical accuracy is attainable.

I consider it of the utmost importance that most of the straightening shall be done while the rails are hot. In other words, that the hot straightening shall be conducted so as to leave the minimum work for the cold press. Every blow of the gag is a bid for a break. The harder the steel, the greater the danger. Moreover, gagging is apt to take out one bend by putting in two others, endeavoring to have two wrongs make a right.

To bring the breaking danger down as low as possible, the cold straightening should be done before the rails are absolutely cold. At the same time, if the rail goes under the cold press too hot, the steel will not possess elasticity, and each blow will leave a dent; and if excessively applied, the rail will be either "wavy" or "lumpy." Such rails will, of course, make a rough track.

Some mills in taking side bends out of their rails apply the gag to the flange. I cannot approve of this, and believe that it greatly increases the danger of broken rails.

But after the rails are delivered to the trackmen, they should not be carelessly thrown from the cars. This was not the practice with the early steel rails.

The drilling should be accurate, and if proper drill presses and drills are used, it can be done. If the holes are to be anything, from 1-32 under to 1-16 over size, I do not see any use in naming the diameter in the specifications.

So long as the purchasers of rails exact a guarantee from rail makers, I think the chemical composition of the steel should be largely left with them. But if the purchaser believes that carbon is the best hardening element for steel, it is not unreasonable to ask for as much as the maker is willto put in, knowing what proportions of other elements his metal will contain, and still guarantee his rails. No doubt as the sections are increased harder steel can be safely used. The mere replacing of a broken rail with a whole one may fall far short of the damage sustained by the road in whose track the accident has occurred; leaving the danger to human life out of consideration. Therefore the purchaser has a right to insist upon some precautions being taken to avoid, as far as possible, such disasters. And these precautions, if correct ones, are also in the interest of the makers.

Steel rails are made very rapidly, and the demands of the trade necessitate that they shall be made very cheaply. The workmen are paid by the piece, and while generally making good wages, they must produce a large tonnage to realize them. No matter how desirous the general menagement may be of producing only good work, it is very necessary that safeguards should be provided. Most makers have these in some form, but there are mills where the chances are taken.

The tests which I prefer are those I used for 15 years at Troy. My experience gives me confidence in them. I do not wish to say that Troy rails have never broken in service, but such accidents have been very infrequent, and could almost always be traced to individual mechanical causes. This plan of making tests has the merit of furnishing a check on the grade of the steel early in its manipulation, and I consider it more convenient than any drop test, and at least equally efficient.

As may be generally known, the Troy Works have for years made a very wide range of Bessemer steels, from 0.05 per cent. to 1 per cent. of carbon, and we were fortunate enough to have considerable reputation for our success in so doing. On the higher grades, where great accuracy was required, it was my practice to have a test ingot taken to represent every 15-in. ingot cast. This accomplished two results: It made the workmen careful, and let us know of any variations which might occur. I do not think this extra precaution necessary in making rail steel in any works where ordinarily good practice prevails, and I should most certainly discourage any of my clients from contracting for rails with others.

As has been proven by the fracture of metal ingots, the metal, in cooling, if the ingot is left upright until the interior steel sets, will form a funnel shaped cavity at its top end. But if the ingot is thrown upon its side before that metal has solidified, this cavity will extend lengthwise, the distance being limited by the condition of the interior steel. Hence it is manifest that ingots should not leave an upright position before the metal has set sufficiently to prevent this cavity from so extending. Everything is against this lengthwise defect being taken out by the subsequent rolling of the ingot, and it will most probably cause pipes and cold shuts in the rails; but if the cavity is maintained at the top end of the ingot, it can be cut off. Again, if ingots are drawn too soon from the pit and thrown upon their sides, there is danger of the crust, which has formed at the top end, breaking and permitting the interior liquid steel to escape, or "bleed." That will certainly make a pipe.

It is only from sound and compact ingots that we can hope to produce good rails. Such ingots only can be made by care in casting them. Therefore the careful steel maker will not only use good molds, but also exercise a close supervision over the manner of pouring the heats. When from any cause this is not, or cannot be done, the resulting ingot should not go into No. 1 rails.

Nearly every manufacturer uses somewhat different sized ingots, and frequently they vary in their shape. Of course, each one follows the practice which, under the controlling circumstances, seems to yield the best results. It is well known that the same length ingot will not always roll equally well. I have found when the metal was cracking badly in the blooming rolls good results to be at once obtained by pouring the ingot shorter. Of course this is easily explained and points to the necessity of closely watching and controlling the temperature of the "blow" in the converter. And I fully believe that a strong influence on the quality of the resulting steel rests at this very point.

As every ingot, if properly handled, has more or less of a cavity at its top end; therefore the blooms rolled from it will be piped or spongy at that end. To be certain of having a sound rail made from the upper part of the ingot, a sufficient length must be cut off to remove this spongy steel.

It is not necessary for me to tell this Institute that care should always be exercised in heating steel. As the carbon is increased, so is the danger. I believe more unsatisfactory rails can be traced to over heat in the furnace than any other one cause. I commend our fellow member William Metcalf's paper, "Steel; Its Properies; Its Use in Structures and in Heavy Guns," read before the American Society of Civil Engineers, March 2, 1887, to the careful consideration of every steel maker and user. It is in my judgment worthy to be considered a text book on the treatment of steel.

My investigations of the service of thousands of tons of rails, and the analyses of many hundreds of them, have shown the greatest variation in the wear of rails of the same section and chemical composition. This being so, there must be some physical cause. Can we find a chemical reason for rails showing "soft" in wear having the following chemical composition?

Carbon	0.39
Sulphur	0.059
Phosphorus	0.085
Manganese	0.722

If so, why did another make, in the same track and under seemingly the same conditions, analyzing as follows, wear "hard"?

Carbon	0.40
Sulphur	0.064
Phosphorus	0.080
Manganese	0.779

I could multiply these instances to an indefinite extent, but will not take up time. Our Bessemer friends are all right on

their chemistry. They know a great deal more than the people who made those early good rails, and it is not in that direction that investigation is most needed.

As I said early in this paper, every railmaker wants to give his customers good rails. Now I honestly believe it is to his interest that the purchaser should be represented by intelligent inspection. No matter how good the mill organization may be, the men all work by the ton, and do not always realize the importance to their own interests (which are the same as their employers) that only good work should go out. Hence the right kind of inspection is of assistance to any mill. If I were a purchaser of rails, I should draw fuller specifications than these, which I now have the honor to present to you, and I should accept all the risk of the results. But railroad managers are not yet willing to assume this position. I have therefore endeavored, while not relieving the makers of any responsibility or introducing novel practices, to assist the railroads in obtaining better and more uniform rails.

It is recognized as the commercial rule that rail makers should give a guarantee with their rails. In these specifications I have embraced such an one, as is given by some of the largest makers in the country, and under which they have sold rails for many years. It seems to me to be fair in its provisions, and I believe the other requirements of my specifications will tend largely in the direction of making the sellers safe in the guarantee. If this is so, the railroads will, of course, receive satisfactory rails, and everybody ought to be happy.

SPECIFICATIONS FOR BESSEMER STEEL RAILS.

Section.

SEC. 1. The section of the rail rolled shall conform to the template furnished by the railroad company, with an allowance in height of $\frac{1}{64}$ of an inch under, and $\frac{1}{32}$ over, being permitted in a delivery of 10,000 tons of rails. The fit of the fishing or "male" template shall be maintained perfect.

SEC. 2. The weight of the rail shall be kept as near to —— lbs. per yard as is practicable, after complying with Sec. 1.

Lengths.

SEC. 3. The standard length of rail shall be 30 ft. at a temperature of 60 degrees Fahrenheit. Shorter rails of —— length will be accepted to the extent of 10 per cent. of the entire order. A variation in length of $\frac{1}{4}$ of an in. longer or shorter than the above specified lengths will be allowed.

Finish.

SEC. 4. The rails must be free from all mechanical defects and flaws, and shall be sawed square at the ends, and the burrs made by the saws carefully chipped and filed off, particularly under the head and on top of the flange. In sawing care must be taken to avoid a flow of steel which will produce a swell on the top of lower flange, as the rail lays under the saw, thereby affecting the fit of the fish-plate.

SEC. 5. The rails shall be smooth on the heads, straight in all directions, both surface and line, and without any twist, waves, or kinks, particular attention being given to having the ends without kinks or drop. The hot straightening shall be carefully done, so that gagging under the cold press will be reduced to the minimum, and so applied that the rails shall not be made "lumpy."

Drilling.

SEC. 6. Circular holes —— in. in diameter shall be drilled through the web at —— in. from the bottom of the flange. The centre of the first hole —— in. from the end of the rail, and —— in. from the centre of the first to the centre of the second hole, and so on if more than two holes are required. These holes must be accurate in drilling in every respect, and left without burrs.

Branding.

SEC. 7. The number of the charge, the name of the maker, the month and year of manufacture, shall be marked in plain letters and figures on the side of the web of the rail in such a position as not to be covered by the fish-plates when laid in the track. If the purchaser prefers, the number of the charge shall be stamped on the end of the rail.

Percentage of Carbon.

SEC. 8. The steel to contain as high a percentage of carbon as the maker is willing to put in and still meet the requirements of Sections 9 and 21.

Tests.

SEC. 9. While the heat is being cast, two (2) test ingots shall be made. The first from steel going into the first regular ingot; the other from metal representing the last one. These test ingots shall be 3 in. × 3 in., and not less than 4 in. long. From them bars at least $\frac{1}{2}$ in. square shall be drawn at one heat by hammering. Each bar when cold shall be bent, without breaking, by the blows of a sledge, to not less than a right angle. Should one bar from a heat fail and the other stand the test, a third bar may be taken from a bloom rolled from the same ingot represented by the failed bar. If this stands the test, it shall be accepted in lieu of the failed one. If the makers choose, more than the two test ingots may be taken, but they must be from the steel of the first and last regular ingots. If this is done and a test bar fail, another one may be drawn from the duplicate ingot and tested, and if it stands, accepted.

Treatment of Ingots, etc.

SEC. 10. After the ingots are cast, they shall be either constantly kept in an upright position until ready to be rolled, or else so maintained until the interior steel has had time to solidify.

SEC. 11. No "bled" ingots, or ingots from "chilled" heats, shall be used in the manufacture of rails under this contract.

SEC. 12. No ingots from badly teemed heats shall be used, excepting as they shall be subject to the provisions of Sec. 16.

Cutting of Blooms.

SEC. 13. After cutting off, or allowing for the "sand" or top end of each ingot, at least 12 in. more of seemingly solid steel shall be cut off that end of the bloom, or partially formed rail; if the latter, then the pieces so cut off shall equal 12 in. in length of a 7 × 7 in. bloom; a greater length than 12 in. being preferred; and if after cutting such length the steel does not look solid, the cutting shall continue until it does.

Heating.

SEC. 14. Care shall be taken to avoid overheating the steel, in shape of either ingots or blooms, and under no circumstances shall a "cinder" heat be allowed. That is a heat high enough to cause the cinder to run off the steel as it is being drawn from the furnace. This does not apply to cinder which may be sticking to the under-side of the steel, when drawn from a horizontal furnace, or to the bottom of an ingot, when drawn from a soaking pit.

Inspection.

SEC. 15. Inspectors representing the purchaser shall have free entry to the works of the makers at all times while this contract is being filled; and shall have all reasonable facilities afforded, to satisfy them that the rails are being made in accordance with these specifications. The makers shall furnish them with the carbon determinations of each heat, if so required.

SEC. 16. The inspectors shall have power to reject rails made from insufficiently sheared blooms, or from heats the test pieces of which have failed, or from badly poured heats, or from "chilled" heats, or from "bled" ingots. The rails made from uncut blooms, if otherwise perfect, to be afterward received as No. 1 short rails, if sufficient lengths have been sawed off to make an amount of steel equal to the original demand of 12 in. The rails made from heats, the test pieces of which have failed, may be accepted as No. 2 rails. The rails from a badly poured heat may be received as No. 2 rails; but if made from a "chilled" heat or "bled" ingot, to be absolutely rejected. By an imperfectly poured heat is meant one which from any cause has been teemed without the control of the operator. A "chilled" heat is one which, from the steel chilling, has to be either pricked or poured over the top of the ladle. A "bled" ingot is one from the centre of which the liquid steel has been permitted to escape.

SEC. 17. Imperfectly drilled, straightened or chipped and filed rails shall be rejected, but will be accepted after being properly finished.

SEC. 18. Rails failing to comply with Sec. 1 will be rejected as No. 1 rails.

No. 2 Rails.

SEC. 19. The requirements of No. 2 rails shall be the same as for the No. 1, excepting they will be accepted with a flaw in the head not exceeding $\frac{1}{4}$ of an inch, and flaws in the flanges not exceeding $\frac{1}{2}$ in. in depth, and may have been made from an imperfectly poured ingot, or heats from which the test bars have failed.

SEC. 20. No 2 rails to the extent of —— per cent. of the whole order will be received.

Guarantee.

SEC. 21. The rail makers to guarantee the No. 1 rails against breakage and unusual wear at the ends or elsewhere for five years from the time of delivery to the railroad company; and should any such rails so fail, will, upon the return of such failed rails to their works, deliver free of cost on cars at their works perfect rails to replace such failed rails; the failure of which is not attributable to improper laying or want of care after being laid, or unusual circumstances of derailment from failure of other railway machinery or appliances, or negligence of the railroad company's employés. In event of failure at the ends or elsewhere of the No. 1 rails, not exceeding 10 per cent. of the amount of the contract, before the expiration of the five years guaranteed (and when the rails in all other respects warrant such a course), the railroad company will cause to be cut off so much of such rails as may be necessary to make perfect rails of them, but in no case leaving them less than —— ft. in length. The maker to pay in cash for cutting, redrilling and restraightening such rails. The loss in weight so sustained by the railroad company to be made up to them by the makers, on the return to them of the pieces so cut off, in good and perfect full length rails of such section as may be agreed upon. The points of delivery of failed rails, ends of rails cut off, and rails to replace the same, or mode of such settlement, may be varied to conform to the peculiarities of each contract.

Continuous Heating.

We are permitted to publish the following information concerning the present use on various railroads of the systems of heating trains by steam taken from the locomotive. The list is not given as complete. Some companies which are known to be experimenting send no information, and others have requested that the information given be not published:

Atchison, Topeka & Santa Fe: Has ordered sufficient material to equip 40 engines for steam heating, but is not certain that all of these engines will be put into service the present season. A good many passenger cars are already equipped.

Baltimore & Ohio: Two trains are equipped with a system designed by officials of the company, which will be put into service for testing as soon as heating is required.

Beech Creek: Nine cars and 3 locomotives are equipped with the Martin system.

Boston & Albany: Practically the entire passenger equipment is fitted with the Martin.

Brooklyn & Brighton Beach: All the cars which are run in the winter are heated by the American steam heating system, and have been for 4 years.

Buffalo, Rochester & Pittsburgh: The Martin system is used; 4 engines and 6 cars are equipped, and arrangements are making to equip 8 engines and 20 cars.

Burlington, Cedar Rapids & Northern: All of the passenger stock of this company is heated by steam from locomotives. The system was designed by officials of the company, and has proved very satisfactory. Four trains so equipped were run all last winter.

Central Vermont: No permanent arrangements have been made, but a local train with the Sewall system is running, and it is found very satisfactory.

Charleston & Savannah: The vestibule train run last winter was heated with the Gold system in connection with the Baker heater. It is not now running.

Chicago, Milwaukee & St. Paul: About 68 cars have been piped for steam heating this winter, including all through and local trains between Chicago and Minneapolis, local trains on the Chicago & Minneapolis Short Line, and the local trains from St. Paul to Owatonna. About 35 locomotives are fitted. The system used is known as the Gibbs system, designed by the Mechanical Engineer of the road. Provision is also made for ventilation.

Chicago & Northwestern: No system has been adopted. Tests with several different systems are being made.

Chicago, Rock Island & Pacific: After a considerable investigation, which extended through nearly all last winter, a large number of cars and engines will be equipped with the Sewall system. This, however, is for experiment. The system has not been adopted definitely.

Cleveland & Canton: 17 cars and 15 locomotives equipped with the Martin system will be in use by the middle of November.

Cleveland, Columbus, Cincinnati & Indianapolis: 27 coaches and 3 engines are equipped with the Martin system now, and it is expected to have 40 engines and 60 coaches running during the winter. The remainder of the passenger stock will be fitted with the Martin by the winter of 1889.

Dunkirk, Allegheny Valley & Pittsburgh: The Martin system is adopted and passenger stock will be fully fitted with it for this winter's service.

Delaware, Lackawanna & Western: 25 locomotives and 75 cars will be equipped with the Gold system by Nov. 1.

Delaware & Hudson Canal Co.: The McElroy system has been adopted; 50 locomotives and 75 cars will be fitted this winter.

Fall Brook Coal Co.: About the 1st of January 8 or 10 locomotives and 15 or 20 coaches will be equipped with the Martin.

Fitchburg: The Sewall system is adopted. All passenger locomotives will be fitted for it and 40 are so fitted now. About 80 passenger cars are now running and all baggage cars will be piped.

Grand Rapids & Indiana: Experiments were made last winter with the McElroy, Martin and Sewall, but no definite conclusions have been reached. Experiments may be continued this winter.

Illinois & St. Louis: All cars, 6 in number, are equipped with the Timlin-Heidinger system for heating and illuminating, which did perfect service all of last winter. The heat is by dry steam from the locomotive, and for lighting, city gas, carried in tanks under the cars, is used.

Kansas City, Wyandotte & Northwestern: Seven coaches and 6 locomotives fitted with the Gold system.

Lake Shore & Michigan Southern: About 115 cars and 75 locomotives equipped with the Martin.

Lehigh Valley: No system has been adopted; experiments are going on. When the company is satisfied as to the best system, all things considered, it will be at once put in use. This road was represented in the committee which agreed to use the McElroy coupler.

Maine Central: About 15 locomotives and 65 cars equipped with the Sewall system, which is in use on all local trains and on all through trains which run to and from connecting roads which use the same system.

Michigan Central: The entire passenger stock will be equipped with the Martin.

Milwaukee & Northern: The Gibbs system has been adopted for all passenger equipment except the Pullman sleepers.

New Brunswick: Four locomotives and 10 passenger cars equipped with the Sewall.

New York Central & Hudson River: All passenger equipment will be fitted with the Martin this winter. The work is already almost finished and all trains will be heated by steam.

New York, Lake Erie & Western: From 50 to 100 cars are piped by the company, and the McElroy coupler will be used.

Northern Pacific: One train was used last winter between Brainerd and Duluth, fitted with the Modern Car-Heating and Lighting System, of St. Paul. It will be run again this winter. A train will be run between Duluth and Superior, equipped with the Erie system. No further experiment is decided upon yet. The Superintendent of Motive Power, etc., says the severe climate of this section of the country will require the very best system.

Ohio & Mississippi: One experimental train fitted with the Safety system. Nothing is decided on for the future.

Pennsylvania: A good deal of experimenting has been done with a "return" system, using the Williames apparatus and modifications by the engineers of the company.

Portland & Ogdensburg: Last winter all trains were heated by the company's own system. Now the Sewall will probably be used, as the road has passed under the control of the Maine Central.

Providence & Worcester: Twelve locomotives and 18 coaches equipped with the Martin. Six of these same locomotives also equipped with the Sewall, as are 6 coaches.

Richmond, Fredericksberg & Potomac: The vestibule train is equipped with the Sewall system.

Rome, Watertown & Ogdensburg: Two trains fitted with the Safety system and 4 with the Martin. Probably a number more will be equipped before cold weather.

Terre Haute & Indianapolis: The Graydon system was used last winter on 2 coaches and one baggage car in a local run. The same train will probably be run this winter. No further experiments are now contemplated.

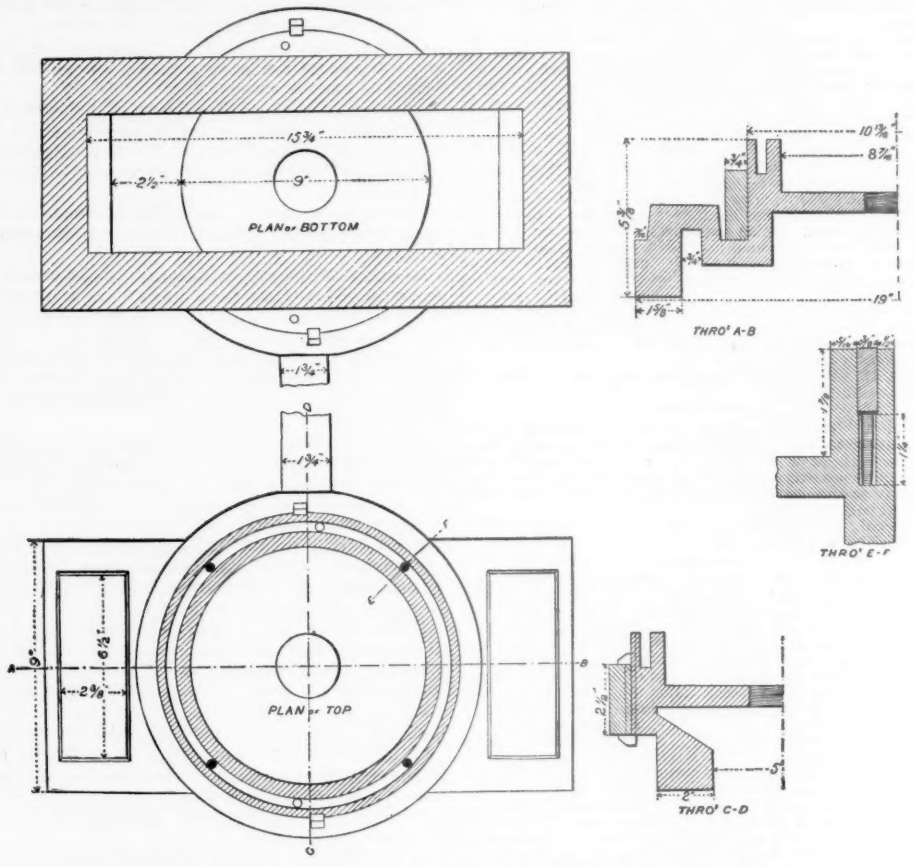
West Shore: All passenger stock will be heated with the Martin system this winter.

Wilmington & Northern: Several systems are under consideration and practical tests will be made shortly.

Wisconsin Central: Two suburban trains in and out of St. Paul are heated by a system devised by officials of the company. It is found good for short trains but has not yet been applied to long trains.

The West Point Tunnel.

The cave in of the West Point tunnel on the West Shore, which took place on the evening of the 16th, proves to be a more serious matter than the early reports indicated, and there are many inaccuracies in the published accounts. The tunnel is about one-half mile long. Some 400 ft. is through loose material, mostly sand. It was here, some 850 ft. from the north end of the tunnel, that the break occurred. The roof of the tunnel is about 130 ft. below the surface, but directly over the break is a basin about 100 ft. in diameter, known locally as "Execution hollow." Here the depth above the tunnel roof is about 108 ft. The tunnel is not lined throughout, but has a brick arch about 3 ft. thick for some 400 ft. through the loose material. This arch had become somewhat deformed,



BALANCED LOCOMOTIVE SLIDE VALVE, FALL BROOK COAL CO.

and the work of strengthening it was in progress and had been completed for about 40 ft. when the break took place. The strengthening of the lining is by 15-in. steel ribs and 24-in. plates. The irregular spaces between the plates and the arch are to be filled with béton. The break in the roof is about 50 ft. long, and there is a depression 2 ft. deep and 30 ft. in diameter in the bottom of the basin above it. The debris will be removed through the tunnel, timbering of course as the work progresses, and it is thought that the tunnel may be clear in a fortnight.

Piston and Balanced Slide Valve, Fall Brook Coal Co.

The accompanying illustrations represent the piston and balanced slide valve used on the locomotives of the Fall Brook Coal Co. and made from the designs of Mr. William A. Foster, Superintendent of Machinery.

The piston rings are made of cast iron and are simply cut in two. The rings are prevented from turning by a ¼-in. dowel pin inserted at the joint. The piston is allowed to ride on the bottom of the cylinder and thus tends to prevent any blow at the joint.

The piston rings are turned $\frac{5}{8}$ in. large in diameter, for 20-in. cylinders, and $\frac{3}{8}$ in. for 16-in. cylinders, and the former rings are $\frac{3}{4}$ in. deep and the latter ½ in., all being $\frac{3}{16}$ in. thick. The rings are made from a casting large enough to make six or eight rings. After turning to the sizes as given above, the ring is bored to give the ring the correct depth. It is then faced up true on one side, and cut off $\frac{1}{64}$ in. wider than the finishing size. The ring is then fastened the faced side to the face plate and is faced on the other side. The rings are cut apart, taking out enough to let them together so that they can be sprung into a ring $\frac{1}{16}$ in. larger than the cylinder. They are then turned the size of the cylinder.

Mr. Foster informs us that on large Moguls with 19×24 cylinders these rings run for 100,000 miles without examination.

It will be seen that this piston possesses the great advantage of simplicity. There are no bolts to get loose or break, and in turn cause a broken cylinder head, etc. This piston is also very cheap. Mr. Foster states that a new piston complete costs about as much as putting in a new bull ring. The solid piston is also far lighter than the ordinary piston.

The piston rod has the United States metallic packing, and is, therefore, free to move laterally.

The balance slide valve is of the type where part of the pressure on the back of the valve is relieved by a ring bearing against a face on the valve chest cover. This ring is held up by four small spiral springs shown by solid black circles in the plan of the top of the valve. Steam is admitted beneath this ring by the two holes showing in plain lines in the same view. The pressure of steam thus supplements the power of the springs should the latter become weak.

If the springs are omitted and dependence is wholly placed upon the steam to keep the ring up, the valve is apt to blow a little when the throttle is first opened.

The packing ring is cast iron, but a small wrought-iron ring ⅛ in. thick is placed beneath it and serves to cover the joint in the packing ring. The joint is, however, made as good a fit as possible. The ring when placed in the groove bears against the inside, and the joint is about $\frac{1}{100}$ in. open. The packing ring is carefully fitted in the groove so that it bears against the inside of the groove and, while a good fit in the groove, does not tend to stick.

The face on the valve chest cover is carefully faced so that the ring works steam tight against it.

The valve buckle is circular, but the valve does not revolve inside the buckle, but is fixed by keys, as shown.

This style of valve is running on 50 of the 60 engines of the Fall Brook Coal Co. and has given great satisfaction, having run 80,000 miles on consolidation engines before needing repairs. After that mileage the ring is renewed and the cover re-faced. The valve and ring are both cast-iron.

Train Accidents in September.

COLLISIONS.

REAR.

1st, on Burlington & Missouri River, near Dorchester, Neb., freight train broke in two and rear section ran into the forward one, wrecking 3 cars.

2d, on Louisville & Nashville, in Louisville, Ky., engine of a freight struck the rear car of a switching freight projecting over the main track from a siding, doing considerable damage.

7th, on Louisville & Nashville, at Muldraugh's Hill, Ky., passenger train ran into the rear of a freight train on a curve, damaging engine and wrecking caboose and several cars, injuring a trainman and a tramp who was stealing a ride. The wreck caught fire, but the flames were soon extinguished.

7th, on St. Louis, Iron Mountain & Southern, near Mill Point, Mo., freight train broke in two, and the rear section was run into by a following freight, wrecking a locomotive and 11 cars.

7th, on Louisville & Nashville, at Clanton, Ala., a freight backing out of a turnout on to the main track where the grade was descending broke in two, and the caboose and several cars got beyond control and collided with the rear end of a departing freight which had just been met. Several cars derailed.

9th, night, on Chicago, Santa Fe & California, in Chicago, passenger train ran into the rear of a freight train, damaging engine and 3 freight cars, killing 15 head of cattle.

9th, a. m., on Pittsburgh, Cincinnati & St. Louis, at Waynesville, O., a circus train, consisting of engine, 10 stock, 20 flat and 5 passenger cars, was run into by a closely following freight, while coming to a stop at a water tank. The caboose of the circus train was totally demolished, and, together with one coach, thrown over an embankment. Several other coaches were partially crushed. Five circus men killed, 22 injured. A dense fog prevailed at the time.

10th, 1 p. m., on New York, Pennsylvania & Ohio, in a narrow cut near Rittman, O., a west-bound excursion train, the engine of which had been disabled by the breaking of a connecting rod, came to a stop and was run into by a closely following freight train, wrecking the freight engine and throwing 4 coaches over an embankment; engineer and a brakeman of the freight and 2 passengers killed, 25 passengers injured. The excursionists, warned of the impending danger, had all escaped from the cars, and were hurrying down the bank when the wrecked cars rolled down upon them. The freight was flagged, the man going back 2,160 ft. to where he could be seen 500 ft. farther, but it was on a descending grade and the speed was uncontrollable.

12th, on Western & Atlantic, at Atlanta, Ga., a yard engine collided with a switching freight and was disabled. One trainman injured.

12th, on Philadelphia & Reading, near Mount Carmel, Pa., freight train ran into the rear of a coal train. Engine and 3 cars wrecked.

13th, on Kansas City, St. Joseph & Council Bluffs, near St. Joseph, Mo., passenger train ran into the rear of a stopped freight train, wrecking engine, caboose and several cars.

A closely following freight was flagged and stopped, but was soon run into by another freight, wrecking engine and 12 cars.

13th, on Louisville & Nashville, in Birmingham, Ala., a yard engine collided with some freight cars, doing some damage.

14th, on New York Central & Hudson River, at Sandbank, N. Y., freight train ran into a preceding freight which had stopped at a water tank. One trainman killed.

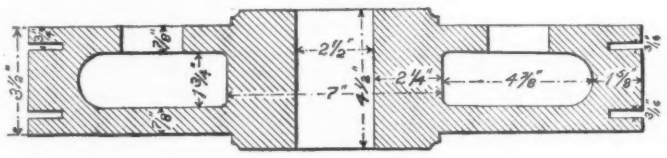
14th, on Baltimore & Potomac, at Calverton, Md., a fast freight train ran into the rear of a preceding freight just going on to a side track, demolishing engine, caboose and several oil cars. The wreck caught fire and was destroyed.

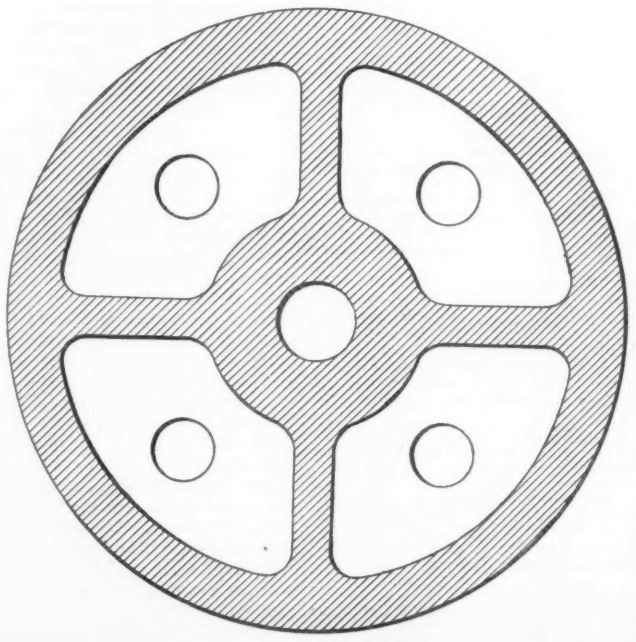
15th, on Chicago & Grand Trunk, in Detroit, Mich., passenger train collided with some freight cars which had run on to the main track from a siding, disabling the engine and damaging several box cars.

16th, on New York Central & Hudson River, at East Rochester, N. Y., a switching freight backed into an engine standing in the yard, the force of the shock driving it into some freight cars standing on the same track. Both engines and several cars damaged.

17th, about 8 p. m., on Pennsylvania road, near Phillipsburg, N. J., a passenger train brought to a stop by a washout was run into by a following freight train. The passenger engine was forced into the washout and was overturned. The freight engine and a Pullman sleeper were badly damaged, injuring several passengers.

17th, on Union Pacific, at Council Bluffs, Ia., freigh





LOCOMOTIVE PISTON, FALL BROOK COAL CO.

Designed by W. A. Foster, *Supt. Machinery.*

train ran into the rear of local passenger train, which had stopped and sent back no flag, doing some damage.

17th, on Valley road, at Willow, O., a freight train ran into a string of cars left on the main track, 5 of which, together with the engine, were badly wrecked.

18th, on Wabash, near Tilton, Ill., a passenger train ran into some freight cars which had run out of a siding on to the main track, doing considerable damage, injuring 2 trainmen and killing a tramp stealing a ride.

19th, on West Shore road, at Catskill, N. Y., freight train ran into the rear of a cattle train standing on a high bridge, damaging engine and throwing one car off the bridge, injuring a drover. It is said that a block signal operator gave a clear signal without the authority of the office at the other end.

19th, 1 a. m., on Chicago, Burlington & Quincy, near Galesburg, Ill., freight train ran into a preceding freight, demolishing engine, caboose and several cars. One trainman killed. The wreck caught fire from the engine and, together with several cars of a freight standing on an adjoining track, was destroyed. Two tramps stealing a ride in a lumber car were burned to death.

20th, on Pittsburgh, Cincinnati & St. Louis, near Fort Ancient, O., freight train ran into a preceding freight, wrecking engine, caboose and 8 cars.

21st, on Little Rock & Fort Smith, near Ozark, Ark., freight train ran into the rear of a preceding freight, which had come to a sudden stop owing to its engine being disabled. A flag was sent back, but the man did not go far enough.

22d, on Cleveland, Lorain & Wheeling, at York, O., freight train broke in two and the rear section ran into the forward one, wrecking several cars and injuring a brakeman.

24th, on Chicago & Alton, at Chenoa, Ill., passenger train ran into a preceding passenger train standing on the main track, doing some damage. It is said that owing to a heavy fog the flagman sent back by the stopped train was not observed.

24th, on Chicago, Burlington & Quincy, at Aurora, Ill., freight train ran over a misplaced switch and into the rear of another freight, damaging an engine, caboose and several cars.

24th, on New York, Lake Erie & Western, at White Mills, Pa., freight train ran into the rear of a preceding freight, demolishing an engine, caboose and 1 car.

26th, on Chicago & Northwestern, near Humboldt, Ia., freight train ran into a preceding freight, wrecking an engine and 8 cars. The wreck caught fire and was destroyed.

27th, on Louisville & Nashville, near Dyas' Creek, Ala., passenger train ran into the rear of a freight train, several cars of which projected over the main track from a siding.

28th, on Fitchburg road, a freight train broke in two at Gardner, Mass., and the rear portion ran back down grade and into the head of a following freight, piling up the engine and several cars in a bad wreck, injuring a trainman.

28th, on Chicago & Northwestern, at Baraboo, Wis., a passenger train ran into some freight cars which had been left standing on the main track and 2 of them, together with the engine, were badly damaged. Engineer seriously injured by jumping.

29th, on Boston & Albany, at Chatham, N. Y., freight train ran into a preceding freight, wrecking 1 car and derailing several others. One trainman hurt.

30th, on Cincinnati, Sandusky & Cleveland, at Springfield, O., passenger train ran into some freight cars standing on the main track, wrecking engine and 7 freight cars.

BUTTING.

4th, on New York Central & Hudson River, at Holley, N. Y., butting collision between two freight trains, damaging the engines. It is stated that through some misunderstanding both trains took the siding at a meeting place.

4th, on New York, New Haven & Hartford, in New London, Conn., butting collision between an empty passenger train and a freight train, disabling both engines and derailing several freight cars.

5th, on Kansas City, St. Joseph & Council Bluffs, near St. Joseph, Mo., butting collision between two freight trains running rapidly, making a very bad wreck.

7th, on Boston & Albany, at Springfield, Mass., butting collision between two switching freights, near the passenger station. One of the trains had a pusher, which was out of sight around a curve, and the engineer failed to observe the signal given him to shut off steam. Two engines and several cars were badly damaged.

11th, on Chicago, Milwaukee & St. Paul, at Minnesota City, Minn., butting collision between two freight trains; 2 trainmen injured.

13th, on Pittsburgh, Cincinnati & St. Louis, at Xenia, O., butting collision between two freight trains.

13th, on Newport News & Mississippi Valley, near Waynesboro, Va., butting collision between a passenger train and a freight train, due to a misapprehension of orders.

13th, on Burlington & Missouri River, at Violet, Neb., butting collision between a passenger train and a freight moving on to a side track, demolishing both engines; 3 trainmen hurt.

13th, on New York, Lake Erie & Western, at Jersey City, N.J., a switch engine standing on the east-bound main track was started and run through a cross-over into the head of a passenger train just starting out of the station on the west-bound track. The switching engine was reversed before it struck, and after the shock immediately started westward on the east bound track, with no person on board.

It ran some distance and into the head of a passenger train approaching from the west. Two passengers on the latter train were injured. The engineer of the switcher jumped just previous to the first collision and was run over and killed. The reason for his blunder is inexplicable.

14th, on Delaware, Lackawanna & Western, at Orange, N. J., passenger train ran over a misplaced switch and into the head of a switching freight, disabling both engines and derailing one car. One trainman and one passenger injured.

16th, on New York, Pennsylvania & Ohio, near Akron, O., butting collision between two freight trains on a sharp curve, wrecking both engines and 9 cars; 1 trainmen killed, 2 trainmen and a tramp injured. It is said that an operator neglected to hold one of the trains.

17th, 2 a. m., on Virginia Midland, near Culpepper, Va., butting collision between a passenger train and a freight, demolishing both engines and several cars of each train. One trainman killed, 4 injured.

17th, on Philadelphia & Reading, in Philadelphia, Pa., butting collision between two coal trains, disabling both engines and derailing several cars.

19th, on St. Louis, Keokuk & Northwestern, at Love's Station, Mo., butting collision between a passenger train and a freight, wrecking the engines, baggage car and several freight cars; 1 trainman killed, 2 trainmen and several passengers injured. It is said that the runner of the passenger forgot his orders and passed a meeting point.

20th, on Chicago, Milwaukee & St. Paul, in La Crosse, Wis., butting collision between a freight train and an empty engine, disabling the latter.

24th, on Lake Shore & Michigan Southern, at Millbury, O., a freight train ran over a misplaced switch and into the head of another freight standing on a side track, piling up the locomotives and several cars of each train in a bad wreck, in which 1 trainman was killed.

24th, on New York, Lake Erie & Western, near Allegany, Pa., butting collision between two freights, wrecking both engines and 20 cars. Fireman badly hurt.

28th, on Chicago & Alton, near Chicago, Ill., butting collision between two freight trains, disabling the engines and derailing several cars.

29th, on Chicago, Milwaukee & St. Paul, near Western Union Junction, Wis., butting collision between a freight train and an empty engine, wrecking both locomotives and 18 cars.

30th, on Louisville, New Albany & Chicago, at New Albany, Ind., butting collision between a passenger train and a freight, demolishing both engines; 2 trainmen injured.

CROSSING AND MISCELLANEOUS.

4th, p. m., at the crossing in Lima, O., a Pittsburgh, Fort Wayne & Chicago passenger train ran into a Lake Erie & Western passenger train, the engine striking the baggage car, wrecking both. It is said that the air brakes on the Fort Wayne train were out of order.

10th, in Chicago, Ill., Chicago & Eastern Illinois freight collided with a Pittsburgh, Fort Wayne & Chicago freight, wrecking both engines and 10 cars. There was a mistake in signaling.

14th, at Louisiana, Mo., a St. Louis, Keokuk & Northwestern freight ran into a string of empty Chicago & Alton freight cars, 4 of which, together with the engine, were wrecked.

15th, on Evansville & Terre Haute, at Ellison, Ind., passenger train crashed into the side of a freight going on to a side track, damaging the engine and 4 freight cars. One trainman injured.

18th, at the crossing at Hoopeston, Ill., a Chicago & Eastern Illinois passenger train ran into a Lake Erie & Western freight train, wrecking an engine and several cars. One trainman injured.

19th, at the crossing at East Winona, Wis., a Chicago, Burlington & Northern passenger train was run into by a Chicago & Northwestern construction train. The rear sleeper was overturned, the coach just in front of it rolling down an embankment and landing right side up in about four feet of water. Eighteen passengers injured.

19th, at Pueblo, Col., a Denver, Texas & Fort Worth freight ran into the side of a Denver & Rio Grande freight just going on to a siding, wrecking engine and several cars.

25th, at the crossing at Menominee, Ill., a Chicago, St. Paul & Kansas City freight train collided with an Illinois Central construction train, killing a laborer and injuring several others.

25th, on West Shore road, at Fort Montgomery, N. Y., freight train ran into the side of another freight, backing through a cross-over track, wrecking an engine and 4 cars. A flagman thought he was called in when he was not and so gave a clear signal too soon.

25th, 8 a. m., at the crossing near Galena, Ill., a Chicago, St. Paul & Kansas City freight ran into an Illinois Central construction train, wrecking the caboose of the latter and 6 cars of the freight. A laborer was killed and 1 trainman and 3 other laborers were injured.

26th, 7 p. m., on Manhattan Elevated, at Sixty-fourth street and Ninth avenue, New York City, a north-bound passenger train ran into the side of an empty passenger train which was just pulling out of a siding, and also moving northward. One car of the loaded train was derailed and was kept from falling to the street only by the hand railing at the side of the track. Two cars of the empty train were overturned and fell upon the transverse braces extending from one track to the other. Two trucks fell to the street, lodging upon the horse railroad track. The runner of the loaded train disregarded a red light which plainly indicated that the switch was set for the side track.

29th, at the crossing, near Claypool, Ind., collision between New York, Chicago & St. Louis freight and Cincinnati, Wabash & Michigan freight doing considerable damage.

DERAILMENTS.

DEFECTS OF ROAD.

2d, on West Jersey, in Camden, N. J., as a passenger train approached the station the rear truck of the last car was derailed, apparently by a defective switch, causing the car to swerve around and collide with a locomotive passing on an adjoining track, doing some damage and slightly injuring several passengers.

11th, on Missouri Pacific, near Burleson, Tex., engine, tender and 1 car of a freight broke through a bridge and were wrecked; engineer and fireman badly hurt.

14th, on Missouri Pacific, near Jefferson City, Mo., 3 cars of a tie train derailed by bad track; brakeman slightly hurt.

14th, on Oregon Railway & Navigation Co.'s road, near Mosier, Or., engine and 6 cars of a freight broke through a burning bridge and were destroyed; engineer badly hurt.

15th, on Northern Pacific, near Sprague, Wash. Ter., a freight train broke through a bridge wrecking nearly the whole train. One trainman injured.

17th, on Cleveland, Akron & Columbus, near Williamsburg, O., engine and 5 cars of freight train derailed by a broken frog and wrecked.

17th, on Cleveland, Akron & Columbus, near Akron, O., 15 loaded cars in a freight train derailed by a broken frog and badly wrecked. One trainman injured.

23d, on Central of New Jersey, at Elizabethport, N. J., freight train derailed by a defective frog. The engine was overturned in the ditch and a portion of the train badly wrecked.

27th, on Louisville & Nashville, at Ensley City, Ala., engine and several cars of freight train derailed by a defective frog. The engine was overturned in the ditch.

29th, 5 a. m., on St. Louis, Iron Mountain & Southern, near Fredericktown, Mo., a bridge over the St. Francis River gave way under a passing freight train, and the first 7 cars went down a distance of 50 ft. in a complete wreck. The engine and tender got across safely. The runner, feeling the bridge sway, put on full steam, breaking the coupling between the tender and first car. The bridge (wooden) was being replaced by an iron structure, which latter had been nearly completed.

30th, on Columbus & Western, nearly Goodwater Station, Ala., freight train, consisting of engine, caboose and 16 cars, broke through a trestle bridge over Wild Cat Creek, falling a distance of 60 ft., making a very bad wreck, in which 1 trainman was killed, and 5 trainmen and a man riding on the engine were seriously injured. It is said that the foundations of the structure has been impaired by heavy rains.

DEFECTS OF EQUIPMENT.

1st, on Philadelphia & Reading, near Locust Gap, Pa., several cars of a freight derailed and wrecked by the breaking of a truck. Conductor hurt.

1st, on Gulf, Colorado & Santa Fe, near Valley View, Tex., 4 cars of a freight train derailed by the breaking of a truck under one of them.

8th, on Lehigh Valley, near Glen Summit, Pa., 20 cars of a freight train were thrown from the track and piled up in a very bad wreck by the breaking of an axle. The wreck caught fire from an oil car and was consumed.

9th, on the Central of New Jersey, in Elizabeth, N. J., engine of freight derailed and overturned, owing to some mishap to the pilot. Engineer and fireman hurt.

13th, on Lake Shore & Michigan Southern, near Swanton, O., 3 cars of a freight train derailed and wrecked by the breaking of a wheel.

15th, on East Tennessee, Virginia & Georgia, near Logan's Station, Ala., several cars of a freight train derailed by a broken axle and thrown in the ditch.

22d, on Buffalo & Southwestern, near Lawton's, N. Y., freight train got beyond control of the brakemen by the breaking of a brake rod and 9 heavily loaded cars were derailed. A brakeman was injured in jumping.

25th, on Grand Rapids & Indiana, at Alba, Mich., 20 cars of an ore train were derailed and wrecked by the breaking of a draw bar.

NEGLIGENCE IN OPERATING.

2d, on Chicago, Burlington & Quincy, in Chicago, Ill., several cars of a switching freight were backed off the end of a track, demolishing an adjacent building.

11th, Kansas City, Ft. Scott & Memphis, at Black Rock, Ark., passenger train ran over a misplaced switch and into some freight cars standing on a siding, 3 of which and the engine were wrecked.

14th, 5 a. m., on Baltimore & Ohio, at Ankenytown, O., as a west-bound passenger train, consisting of engine and 7 cars, was passing an east-bound freight train standing on a siding, the mail car was derailed and thrown against the side of the engine of the freight, causing the explosion of its boiler. The baggage car was thrown diagonally across the track and crushed by the first of the coaches. As the train was moving rapidly, this car received the full force of the explosion, and was immediately filled with steam and hot water, scalding the occupants. The baggageman was crushed to death, engineer and brakemen of the freight killed, and 36 passengers injured, several fatally. The coroner's jury finds that a brakeman of the freight failed to properly set the switch.

25th, on West Jersey, at Manumuskin, N. J., as a passenger train was going on to a siding, a switch was turned too soon and the rear car was derailed, damaging the end of the next coach. A man standing near the track was struck by the derailed car and seriously injured.

25th, on Georgia Pacific, in Birmingham, Ala., a yard engine pushed 3 freight cars off the end of a spur track, demolishing a watchman's house.

28th, on Grand Rapids, Lansing & Detroit, near Detroit, Mich., passenger train derailed by a misplaced switch, the engine being overturned in the ditch.

UNFORESEEN OBSTRUCTIONS.

11th, on East Tennessee, Virginia & Georgia, near Macon, Ga., freight train thrown from the track by the spreading of the rails at a point where the roadbed had been impaired by freshet.

11th, on Baltimore & Ohio, near Connellsville, Pa., a passenger train struck a large tree which had been overthrown in a storm so as to obstruct the track, many car windows were broken and several passengers were cut by flying glass.

12th, on Union Pacific, near Pocatello, Idaho, passenger train ran into a herd of cattle and several cars were derailed and wrecked. Three "persons" killed and 11 injured.

14th, on Saginaw, Tuscola & Huron, near Berne, Mich., passenger train, consisting of engine, baggage and express car and one coach, was thrown from the track at a point where forest fires had weakened the sleepers. The locomotive was overturned in the ditch and the cars caught fire and burned up. Several trainmen and passengers bruised and burned.

18th, on Union Pacific, near Gardner, Neb., passenger train thrown from the track by a rail which had been maliciously broken.

19th, on Wabash Western, near Bridgeton, Mo., freight train derailed at a switch which had been maliciously obstructed by a piece of iron. Two trainmen killed and 1 trainman and a drover badly injured.

23d, on San Antonio & Aransas Pass, near Boerne, Tex., passenger train ran over a cow, and 1 car was derailed and went over an embankment. One passenger killed and several injured.

24th, on Pennsylvania, near Fairchance, Pa., freight train ran over a cow, and the engine was derailed, overturned and badly damaged. Three trainmen severely injured, and a tramp killed.

27th, on San Francisco & North Pacific Coast, near Petaluma, Cal., a freight train ran over a cow, derailing several cars.

28th, night, on Union Pacific, near Pocatello, Idaho, freight train ran over a herd of cattle, and was derailed and badly wrecked. Two tramps stealing a ride in a box-car and 3 trainmen were killed.

28th, on Northern Pacific, near Heron, Mont., freight train ran over a herd of cattle, and engine and several cars were derailed and wrecked.

29th, on St. Louis, Iron Mountain & Southern, near Newport, Ark., freight train ran over a cow, and the engine and 9 cars left the track and went into the ditch. Fireman was caught in the wreck and killed.

30th, about 2 a. m., on Cincinnati, New Orleans & Texas Pacific, near Spring City, Tenn., a freight train was derailed by running over a cow which had fallen into a cattle-guard, wrecking engine and 15 cars. One trainman killed, one fatally and several others slightly injured.

UNEXPLAINED.

4th, on Missouri Pacific, near Harrisonville, Mo., freight train derailed, several cars wrecked. A brakeman was killed.

4th, on Baltimore & Ohio, at Downs, W. Va., as a passenger train was leaving the station one of its cars was derailed, overturned and dragged some distance, injuring 12 passengers.

6th, night, on Gulf, Colorado & Santa Fe, near Coleman Junction, Tex., locomotive of passenger train derailed and overturned; engineer hurt.

8th, on Louisville & Nashville, near Decatur, Ala., a truck of a car in a moving freight train was derailed and went into the ditch. The end of the car was supported by the car next to it, and the loss was not discovered until the train reached the next station.

8th, on Oregon Railway & Navigation Co., near Rawson Springs, Or., passenger train derailed.

9th, on Missouri Pacific, near Smithton, Mo., 7 cars of a freight train derailed and badly wrecked.

11th, on Zanesville & Ohio River, near Harmar, O., passenger train derailed on a curve, damaging the engine; engineer and fireman badly hurt.

14th, on New York, New Haven & Hartford, in New Haven, Ct., passenger train derailed.

16th, on Cincinnati, Indianapolis, St. Louis & Chicago, near Indianapolis, Ind., a car in a passenger train was derailed at a switch and thrown over on its side, injuring 5 passengers.

16th, on Salt Lake & Fort Douglas, near Salt Lake City, Utah, car of passenger train derailed.

17th, on Cincinnati, New Orleans & Texas Pacific, in Windom, Ky., freight train derailed doing considerable damage.

20th, on Housatonic road, near Lee, Mass., baggage car of passenger train derailed.

20th, on Boston & Maine, in Portland, Me., switching engine derailed.

26th, on Union Pacific, near Topaz Station, Idaho, engine

and 20 cars of coal train derailed and wrecked; 3 trainmen killed.

27th, on Mobile & Ohio, near Alto Paso, Ill., tender truck of engine of freight train jumped the track, derailing it and 3 following cars. The engineer, who jumped from the engine, fell under the wheels and was killed.

27th, on New York, Lake Erie & Western, near Goshen, N. Y., caboose and 3 cars of a freight train derailed, injuring a trainman.

27th, on Missouri Pacific, near Belcher, Tex., 10 cars of cattle train derailed and badly wrecked; 100 cattle killed.

28th, night, on Toledo & Ohio Central, at McConnelsville, Ohio, freight train derailed and wrecked; engineer badly hurt.

28th, on International & Great Northern, near Overton, Tex., several cars of a mixed train derailed.

OTHER ACCIDENTS.

8th, on Michigan Central, at Comstock, Mich., engine of rapidly moving passenger train broke a connecting-rod, one end of which crashed through the cab, seriously injuring the fireman.

24th, on Manhattan (elevated), near Houston street station, New York City, engine of passenger train blew out a cylinder head.

26th, on New York, New Haven & Hartford, near New Haven, Ct., the roof of a car in a freight train was blown off by a heavy gust of wind. A brakeman was carried into the air with it, but saved himself by catching hold of several telegraph wires.

A summary will be found in another column.

Priestman's Petroleum Engine.

The accompanying engraving represents an engine worked directly by the pressure generated by the explosive combustion of petroleum. This engine is in successful use in Great Britain and is now being introduced in this country. The advantages of being able to dispense with a boiler are obvious, and should render an engine of this form especially useful for small powers where the extra cost of a boiler and attendant would be a formidable objection. A small engine which could be started at a few minutes' notice without getting up steam is often wanted on a railroad for pumping at outlying water stations, driving small shops, working traversers, turn-tables, cranes, elevators, etc.

The working of the engine may be briefly described as follows: A small jet of compressed air throws a spray of mingled air and petroleum into the cylinder, where the charge is exploded by means of an electric spark, the current being sent through two platinum points by means of a battery. The engine is single acting, the pressure being only on one side of the piston. The indicator diagrams show considerable expansion and very little loss from any cause. The especial merits claimed for the engine are that the speed or power of the engine can be varied by a governor which regulates the amount of explosive mixture admitted to the cylinder, but does not interfere with the relative proportions of oil and air, or wholly cut off the supply as in gas engines. The result is that complete combustion is attained, as shown by the clean condition of the platinum points. The regular intervals at which the explosions recur are also favorable to the smooth running of the engine.

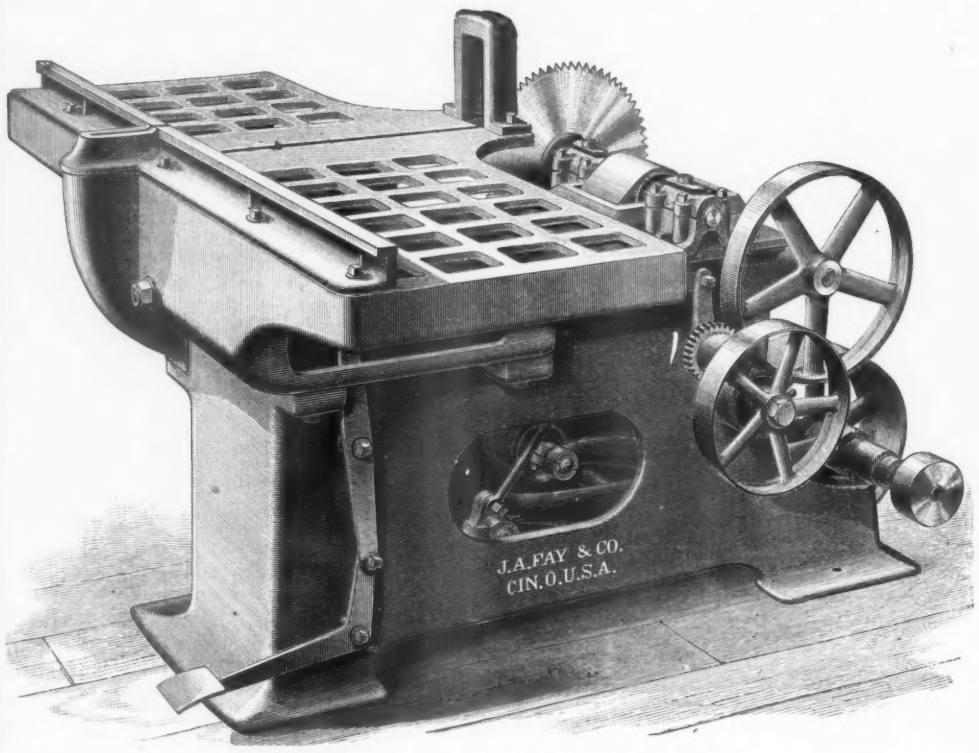
Tests made by Sir William Thompson, Sir Samuel Canning and other eminent scientists show a consumption of 1.7 pints of ordinary refined petroleum per brake H. P. per hour, equal to about .85 per I. H. P. per hour. The cost, therefore, for fuel at ordinary prices would be about equal to that for a steam engine, while the petroleum engine would have the advantages of being able to start at short notice and dispense with a boiler, chimney and certified boiler.

Two of these engines are at work at 106 Washington street, New York, where any further information can be obtained.

Fay's Automatic Railroad Cutting-Off Saw.

The accompanying illustration represents a patent automatic railway cutting off saw, with iron table, and automatically traversing arbor. The machine is made by Messrs. J. A. Fay & Co., of Cincinnati, O., and is designed for cutting up to accurate lengths all kinds of material used in car shops, planing mills, etc. It is one of the most substantial and powerful machines of its kind ever built, and is guaranteed to do the work of two ordinary machines. It is automatic in its operation, the saw being propelled back and forth by means of the chain feed, actuated by the feed lever in front.

The frame is formed of one heavy casting, with large floor base, rendering it self-contained. The countershaft is attached to the base of the machine, and can be belted from above or below the floor.



PATENT AUTOMATIC RAILROAD CUTTING OFF-SAW.

Made by Messrs. J. A. Fay & Co., *Cincinnati, O.*

The guide rails for supporting the traveling carriage are specially wide and heavy, and cast to the frame, securing great permanence in this most important part of the machine.

The arbor is of large diameter, made of best steel, and runs in a connected gateway, having self-oiling bearings. The end of the arbor is provided with a device for increasing the size, allowing the use of saws with varying sizes of holes without the necessity of bushing. The sliding gateway is actuated on the planed guides of the frame by feed mechanism, which, by simply pressing upon the lever in front of the machine, causes the saw to travel in either direction, as may be desired. Adjustable stops are provided for regulating the distance the saw is made to travel in, to suit the different widths of material to be cut off.

The table is made of iron, and attached to the machine in the most substantial manner, and provided with a board measure accurately spaced into inches for convenience to the operator.

Any further information can be obtained of the makers, Messrs. J. A. Fay & Co., Cincinnati, O.

Western Railway Club.

The regular monthly meeting of the Club was held in Chicago, on the afternoon of Oct. 23, in the Club's new quarters in the Phœnix Building. In the absence of President Rhodes, Vice-President Hickey occupied the chair. On motion of Mr. Smith, the constitution was amended so as to provide for the office of Second Vice-President, and Mr. J. N. Barr was at once unanimously elected to the office. Mr. Smith, of the Committee on Publishing the Proceedings, reported in favor of publishing the proceedings of the meetings in the shape of a small pamphlet each month, and recommended that the expenses of such publication, together with the expenses of the stenographer and any other expenses of the Club beyond the annual dues, be provided for by inserting advertisements in the back of such pamphlet. The Committee further recommended that such advertisements be limited in size to one quarter page, and that houses represented in Chicago be solicited to take spaces. On motion the report was received. It was voted to change the day of meeting of the Club to the third Tuesday of each month. The Committee on Publication of Proceedings was continued as a special standing committee.

CIRCULATION OF WATER IN LOCOMOTIVE BOILERS.

Mr. William Forsyth: Mr. Hickey's article on this subject (read at last meeting) states that thick plates would generate more steam with a given amount of fuel. I take it that this opinion is the result of observed facts, rather than a disagreement with the generally conceived notion. I hope Mr. Hickey will explain this point. Mr. Hickey states that the water spaces in the legs of the fire-box in general practice are entirely inadequate. But the question is, what are you going to do about it? You cannot widen because you come in contact with the frame; you can narrow in only at the expense of the grate surface, and so we are driven to what we find in the best locomotive practice of the day, placing the fire-box on top of the frame. This gives a shorter water leg, but ample space for the circulation of water in the fire-box proper. For more space between the tubes the only thing is to make a larger shell. Although the additional diameters we now have give larger water space, we have not taken sufficient advantage of the opportunity to increase the space between the flues.

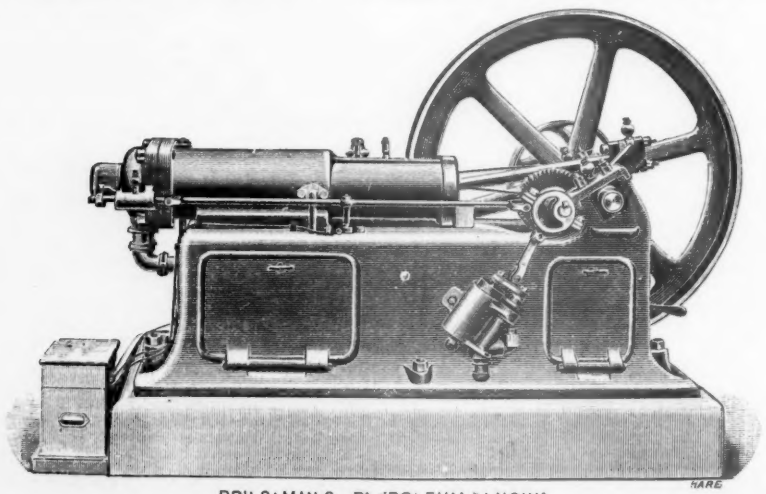
Mr. Hickey: I think a thicker plate than we are generally using would perhaps be more serviceable. It will not conduct the heat as rapidly as a thinner one, but when once hot it will retain the heat and retain it more regularly, and will not be affected by the water or by currents of air as seriously as a thinner one. As to water space in the fire-box, could we not overcome the difficulty by making the inside wall of the fire-box tapering, but retaining the vertical line of the other sheet? We should then increase the water space of the fire-box.

Mr. Forsyth: That could be done, but at the expense of the capacity of the fire-box for combustion of gas.

Mr. Hickey: The space surrounding the flues as in general use is entirely too small. The gases are driven through the tubes, and the full amount of heat cannot be absorbed by the water. That is still more apparent when only a half or a third of the tubes are taking the entire heat through the improper placing of the fire-brick arch.

Mr. Barr: Experiments show the advantage of a thicker fire-box plate, in which there is considerable difference of temperature between the side adjacent to the fire and that in contact with the water. The temperature of a very thin plate is kept so low that it extinguishes the gases and produces imperfect combustion, and it is impossible to get a flame in contact with a very thin plate on account of its low temperature. Studs projecting into the fire-box give beneficial results. The studs become highly heated and transmit a proportion of that heat to the water. On the other hand, if you make the plates thicker and increase their temperature, you are going to increase the amount of expansion and contraction, and we should very soon find that we reached the limit of thickness on account of broken stay bolts. Flues as at present arranged do interfere with the proper contact between the heated surfaces of the flues and the water. Steam destroys that contact, and I do not see any other way to account for the leaking of the flues when a boiler is working very hard, producing an immense amount of steam. Facts regarding deposits in the boiler, their location, etc., would throw light on this question of circulation, but I have made no definite observations.

Mr. Gibbs: We have very little difficulty in getting all



PRIESTMAN'S PETROLEUM ENGINE.

the grate surface we want. What we do want to increase is the volume of the gases, to mix them and have them take a longer course. There is another thing that would be worth looking into, that is to get the dome off of the crown sheet entirely.

Mr. SCHLACKS: We have on part of our road much trouble with impure water. The principal accumulation adheres to the back sheet. Imperfect washing may have something to do with this. As to the inside of the fire-box, the thinner sheets give us the best satisfaction. We decided that a few years ago by using a good quality of steel. The thickness of one fire-box was 5/8 in. on one side and 1/4 on the other. While the 5/8 in. sheet seemed to work all right the first year, after that we found a number of stay bolts broken, I think 32 on the left side and 23 on the right, and the sheet commenced to crack, but with the thinner sheet we saw no defect for three years. But we made the mistake of placing the stay bolts 4 1/2 in. apart, in both cases, and the thin sheet bulged near to the fire. We straightened that up, however, and got along with that fire-box with very little expense for six years.

Mr. CUSHING: The present dimensions of fire-box steel are sufficient and ample for the purpose. The best results would be obtained from a medium thickness of steel rather than extreme thickness; a 5/16 in. sheet would be preferable to one of 5/8 in. The same with the crown sheet. When you go above 5/8 with a crown sheet you lose ground with the steaming qualities of the boiler. I believe that has been the experience of those who have tried thicker crown sheets. In regard to the width of fire-boxes, I have never used bituminous coal, so that I probably have no very clear idea of the difference between the wide and narrow fire-boxes. There is more in the length of the fire-box than in its width. The longer the fire-box the more apt you are to consume all the gases.

Mr. FOSTER: The Rock Island uses many arched crown sheets, and there is absolutely no deposit upon them. They are always absolutely clean, except perhaps a slight scale when the boiler is taken in for repairs. They have radial stays.

Mr. BARR: This custom of radial stays is an important one, and Mr. Foster has presented an important subject especially for those of us who have bad water to struggle with. Is any difficulty experienced in retaining radial stay bolts?

Mr. FOSTER: The straight-backed boiler with radial stays and arched crown sheet is regarded by the Rock Island as cheaper in construction and maintenance than the old crown bar boiler. No failures have occurred. They seem to be fully as strong, and so far as I can see better in every respect. The four middle rows of stay bolts on the inside of the box have nuts on them with the ends of the stay bolts riveted outside of the nuts. The other stay bolts are simply riveted over the sheet with no nuts. That, I take it, is to prevent the crown sheet coming down in case it should get hot.

Mr. CUSHING: Radial stays are decidedly preferable to crown bars where the water is bad. I have used on probably 100 engines. On the whole, it is far more durable and will give better results in the repair shop in the course of ten years by 50 per cent. than the other. Where the water is good there is not much difference between the two boxes.

Mr. BARR: In the construction of a fire-box with radial stay bolts, as I understand it, the area for combustion above the fuel is considerably reduced, compared with the flat top fire-box with crown bars. Now, if this is so, have you observed any difference in the sufficiency so far as combustion is concerned?

Mr. CUSHING: I think when the boiler is properly constructed with radial stay bolts, there would be scarcely any difference, and if the stays are properly put in any difference would be in favor of the radial stay box. No difference is needed in the size of the combustion chamber.

Mr. FOSTER: Of course, the corners of the box must be rounded off, and in that way so much of the area is taken away from the combustion chamber; but our fire-boxes are deep, and the percentage of reduction of area would be very slight.

Mr. PECK: I have 12 engines with radial stays, and 12 without. Some of those with radial stays have not had any repairs, while the others could not run six months without washing the crown sheets. Where you are short of engines it is a great saving to have radial stays. They steam equally well.

Mr. GIBBS: I would like to ask whether in setting the stays, particularly around the corners, they are made radial to the barrel of the boiler or to the crown?

Mr. FOSTER: The attempt is to make the stays radial with the crown, but in some cases it is impossible. We try to have the bolts go into the crown sheet at an angle of not less than 33 degrees. That gives us an ample number of threads in the wagon-top sheet.

Mr. FORSYTH: Crown bars can be dispensed with without sacrificing any of the gas space by the use of direct stays, as we have in the Belpaire box. In that the crown sheet is very nearly straight.

Mr. BARR: I have been informed that the Belpaire fire-box does not carry its water as well.

Mr. FORSYTH: I haven't noticed any difficulty of that kind. They carry the water very regularly. I don't see why there should be as much difference in the circulation as there would be with an ordinary radial stayed boiler.

Mr. BARR: I had the idea that the boiler was more liable to priming; the large flat surface with the shell of the boiler so close to it makes this seem plausible.

Mr. FORSYTH: If that were the case, we should be carrying a great deal of water, and heating that water at the expense of coal; but we find that the contrary is the case. We formerly consumed seven tons of coal carrying nine cars over a certain distance, while with the Belpaire we now carry the same number of cars over the same distance with five tons of coal. This shows there was no material loss from priming.

Mr. BARR: That settles the question of priming; but even with the same amount of priming in both engines, the question still remains whether that economy is due to a superior form of fire-box, or to the increased grate area, or to the interior arrangement of brick arches.

Mr. FORSYTH: The comparison was made with brick arches in both cases, and this advantage is certainly due to a larger grate area and firebox.

The discussion was then closed.

The members were requested to suggest topics for discussion at the next meeting of the club. Mr. Peck suggested the subject of fire-boxes. Mr. Barr suggested continuing the subject before the meeting to-day in connection with the subject of combustion. Mr. Forsyth suggested that in addition to subjects to be discussed by members of the club outside parties who have made a life study of particular topics, should be invited to address the club on their specialties.

Mr. Forsyth's paper on "Material for Car Construction," which was read at the last meeting of the club, was discussed.

Mr. BARR (Chicago, Milwaukee & St. Paul) saw little occasion for criticism of the paper, except that it appeared to him that one pressing point was how the weight of cars might be reduced. He thought that wrought or malleable iron could be often advantageously used instead of cast-iron; and, also, that with good material wheels could safely be run of 550 lbs. each, instead of 600 or 650. He suggested also that a light single roof might be advantageously used instead of a double roof, although better construction should be provided to increase the durability of those parts of the car liable to decay. He thought it possible, also, that for certain parts of cars less rigid inspection of material, and consequent economy, might be practicable.

Mr. FORSYTH (Chicago, Burlington & Quincy) thought increase on weight might be avoided by trussing car below with light iron rods, leaving upper framing as it is in 40,000-lb. car, getting just as strong a car, and saving 5,000 or 6,000 lbs.

Mr. BARR, in answer to a question, said that he considered a 550-lb. wheel of good material safe under a 60,000-lb. car. Everything depended upon the quality of the wheel, which could be ascertained by test.

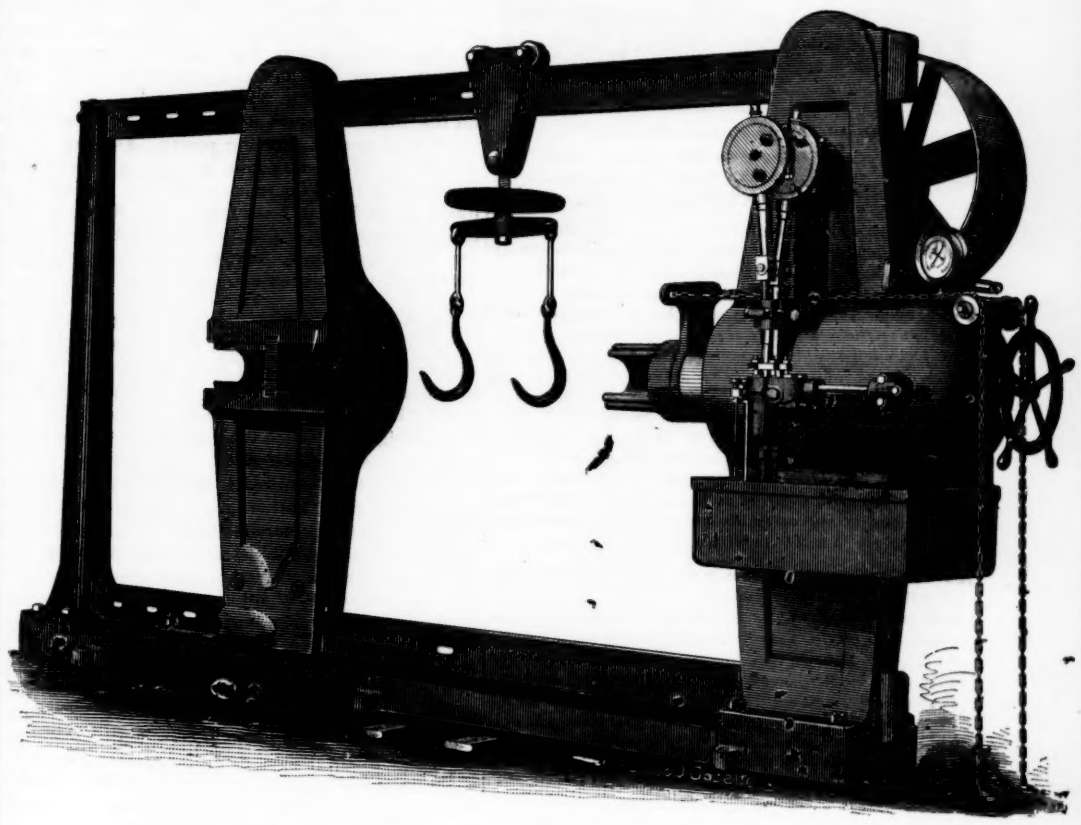
Mr. VERBRYCK (Chicago, Rock Island & Pacific) said that his road used a 600-lb. wheel under all cars, although they have none over 40,000 lbs. He would not run 50,000 or 60,000-lb. cars without increased strength in bridges, rails, etc. He did not think that the difference in the weight of the wheel was a sufficient item for very serious consideration.

Mr. SCHLACKS (Illinois Central) had used the 550-lb. wheel for many years, made of good material, and got very satisfactory mileage and few breakages.

Car Heating by Steam was the next subject taken up.

Mr. SEWALL said that the Chicago & Northwestern is experimenting, with apparent success, with a method for putting steam through the pipes of the Baker heater system, thus saving repiping. The Baker heater could in this way be used either with hot water or steam.

The general opinion with regard to couplers seemed to be that, when a good system of steam heating is provided, the coupler will be found ready.



HYDROSTATIC WHEEL PRESS, 300 TONS CAPACITY.

Made by the NILES TOOL WORKS, *Hamilton, O.*

Hydrostatic Wheel Press.—Niles Tool Works.

The accompanying illustration represents a wheel press recently built for the Fall Brook Coal Co. by the Niles Tool Works, Hamilton, Ohio. This press is made from new patterns and is of 300 tons capacity, and has several novel features.

The principal dimensions are as follows: Distance between tie-bars, 78 in.; capacity, 300 tons; ram, 11 in. diameter.

The machine is of immense strength, as it is found that in pressing off old wheels great pressure is frequently required. This machine has, therefore, been built to withstand a pressure of 300 tons on the ram.

The cylinder is made of cold-blast iron and copper-lined. The pump has two plungers, 1 3/4 in. and 1 in. diameter respectively. The operation of the plungers is controlled by an improved device recently patented, and consists of rods and levers connected with the suction valves. By raising the levers the suction valves are seated and the plungers force water into the cylinder. At the start the combined areas of both are thus utilized. When the pressure rises, the rod connected with the valve of the larger plunger is dropped, unseating the valve and stopping its operation. The smaller plunger continues its work until the wheel is forced to its position; its rod is then dropped and the operation ceases.

The starting and stopping is done instantly, with the least possible exertion on the part of the workman, and without changing his position, and both plungers are utilized at the start to expedite the work.

The cylinder and resistance post are held by two heavy steel tie bars, amply sufficient for the heaviest duty. A cast iron sole-plate supports the entire machine, making it wholly self-contained.

The machine is furnished with pressure gauge, graduated to show pounds per square inch and tons on ram; safety-valve, inclosed in a case wherein it may be locked; relief-valve, weight for ram, tank and wrenches.

The press has tight and loose pulleys, 36 in. dia., for 6-in. belt. Speed, 100 revolutions.

Any further information may be obtained of the makers, the Niles Tool Works, Hamilton, Ohio.

Shipbuilding.

The Newburg Shipbuilding Co., of New York, which has been building iron ferry boats and other craft, has sold its entire plant to the Chesapeake Dry Dock & Construction Co., of Newport News, Va. This concern, which is related to the Huntington syndicate, is just completing under the superintendence of Mr. Francis Collingwood, member of the American Society of Civil Engineers, one of the largest dry docks in the country.

The Union Dry Dock Co., of Buffalo, has just contracted to build, for a syndicate of owners, a first-class steamer of 2,500 tons capacity, with fore and aft compound engines, by H. G. Trout, for $160,000.

The Lehigh Valley has placed a contract in Cleveland for two large steel coal carriers, which are practically duplicates of the E. P. Wilbur, and, when completed, will give them a fleet of nine large "lakers" of great speed.

RAILROAD GAZETTE

Published Every Friday,
At 73 Broadway, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The results of the letter ballot as to the adoption of standards by the Master Car-Builders' Association is very satisfactory as regards appliances for the safety of train hands, three out of the four standards proposed having been adopted. These standards prescribe certain dimensions and methods of construction for running boards, steps and brake-shafts. The suggested standard ladder did not receive sufficient votes to be adopted. The proposed standard dimensions for stem, dead-block and carrier irons of the M. C. B. standard coupler also failed to receive the required two-thirds majority of votes. The proposed standard axle for 60,000 lbs. cars appears to have been a compromise which satisfied neither those in favor of large or of small axles, as it received only 224 affirmative against 307 negative votes. This decision will give plenty of time for a full discussion of the question, and it is to be hoped that it will be definitely settled after the next convention. The adoption of standard dimensions for the parts immediately connected with the Master Car-Builders' coupler is even more important, but the delay will enable the question to be fully ventilated, and the vote, 325 "yes" to 185 "no," shows that there is less difference of opinion on the subject.

Fast trains between Chicago and the Missouri River are not so easily abolished, after all. Through travel to and from Denver is important enough to pay considerable attention to, and the Missouri River becomes a way station, as it were. The Burlington has been making quick time to Denver, via Pacific Junction, and, of course, has increased its share of patronage. This leads the Omaha lines to Denver to desire to make better time, and so it comes about that the Chicago & Northwestern gives the required 90-days' notice of withdrawal from the agreement to adhere to the old slow time-tables. Quick time by this route will of course favor Omaha proper, and so Kansas City will demand similar advantages, and all will probably restore their buzzers, hummers, rustlers, etc. The sensible way would be to alternate the trains over different roads or to calmly weigh the circumstances and provide lower rates by the roads which are not well fitted for buzzing, humming, etc. But if we are to judge by the past we shall first see a season of free competition.

The roads composing the Southern Railway and Steamship Association have been called to account for delaying to conform to the long and short-haul clause. The conditions of traffic in the South have been such that compliance with the requirements of the act was much slower than in any other part of the country, except perhaps on the transcontinental routes. The Commission will probably find help in enforcing the act from an unexpected source—the consolidation of the Georgia Central with the Richmond & West Point Terminal. It has been an all but universal experience that the more nearly complete the monopoly the easier it was to arrange tariffs according to any preconceived system. The absence of competition makes it possible to maintain high through rates; the financial prosperity which such rates induce, makes it possible to reduce local rates for the sake of future development, even at some sacrifice of present earning power. As long as the Norfolk & Western could compel a lowering of competitive rates, the non-competitive business was likely to suffer—at least relatively. Now that this danger is removed, at least for the present, the Southern roads ought to be able to conform to the short-haul requirement much more fully than before.

The Pennsylvania Railroad has refused to transport oil from Washington, Pa., to Baltimore at the rate ordered by the Inter-state Commerce Commission, on the ground that such traffic will be unprofitable to them. The Commission, of course, insists that they have no right to decline to handle the traffic, and must take it at the rates prescribed. This last position is forced upon the Commission as a necessary means of maintaining their authority. If a railroad were at liberty to refuse to handle traffic at the prescribed rates, the shipper would be practically helpless. He would usually much rather pay the higher rate than be deprived of all facilities for moving his goods. If both parties persist in their determination, the matter will have to come before the courts. If it does it will come up in a form especially favorable to the railroads. Had the Pennsylvania Company simply appealed against the decision of the Commission, the court might have been reluctant to discuss the question what constitutes a reasonable rate. But if the company declares that it would rather sacrifice the traffic than handle it at the compensation offered, the court is in a measure forced to consider in detail the question whether the prescribed rate is adequate. We shall await the result of any such appeal with great interest.

It can hardly be questioned that an increase in the capacity of a freight car calls for increased strength in all the parts. The 40,000-lb. freight car, as usually constructed a few years ago, has not proved a whit too strong or durable in service, and in view of the still increasing power of locomotives and speed of trains, cars are almost universally now made stronger and heavier than was the case a few years ago. It may reasonably be expected that they will prove correspondingly more durable and less liable to failure and consequent delay on the road. One of the points which most needs attention is the proper dimensions of the axle to safely carry the heavier car and load without heating or breaking. It is very generally conceded that the size of the axle should be increased, but the rejection of the standard 60,000-lb. axle proposed at the last Master Car Builders' Convention leaves the exact dimensions undecided. The adoption of two standards, one with a considerable increase in size and strength with a corresponding gain in durability, would meet the views of many members, while others would prefer an axle only slightly larger than those at present in use, on the ground that when worn this new axle could be used under 40,000-lb. cars. As the axle confessedly needs increased strength to carry an addition of fully 50 per cent. to the load upon it, the wheel also manifestly needs increasing in weight and strength. One speaker at the recent meeting of the Western Railroad Club urged that an improvement in quality would actually enable the weight to be reduced. Whether such a considerable improvement of quality is possible seems doubtful, and it would seem to be far the more prudent course to insist on at least a 20 per cent. increase in weight, in combination with a 30 or 40 per cent. improvement in quality, to meet an increase of 55 per cent. of the weight to be carried and an increase of 20 per cent. or more in the speed.

The *Iron Age* prints the following figures of the cost of a chilled wheel as having been obtained from the Taylor Iron Works. Using a mixture three-quarters charcoal pig, at $26.50, and one-quarter old wheels, at $19 per ton, the stock costs $24.62 per ton, or $6.16 per wheel, four wheels being made from the ton. The cost items are then for one wheel:

Iron	$6.16
Melting, core drying	.20
Sand, molds and cores, flour and facing	.15
Foundry labor of molding and casting	.85
Outside work, unloading materials	.10
Repairs, wear and tear, taxes, insurance, motive power and delivery charges	.40
Cost	$7.86

Last May we gave the experience of one wheel-maker who had sold his product at $10, and made a profit for the year of 15 cents per wheel. We then estimated the cost of the mixture specified by the C., B. & Q. at $6.63 for a 550-lb wheel, and gave the statement of one of the best and largest makers of chilled wheels that the cost of manufacture would amount to $2.50 per wheel. This made a wheel cost $9.13. Another mixture, containing 40 per cent. of old wheels, made a 550-lb. wheel cost $8.50. These *cost* prices are for wheels that may be used with reasonable safety, and the lowest figure given above is higher than the *selling* prices most commonly obtained recently. The quotations of pig iron are open to every one, and every one can judge whether or not a wheel at $7 or $7.50 can possibly be made of metal that can be classed as good car wheel iron. In short, when wheels are sold at these latter prices it is impossible to escape the conclusion that the makers are working very close to the danger line.

The Canadian Pacific is stoutly opposing the crossing of its southwestern branch, near Winnipeg, by the Portage extension of the Red River Valley Railway. The provincial authorities propose to fight for the crossing if necessary. The President of the Canadian Pacific is reported as saying that his company merely asks that the crossing shall be made in conformity with the law, and that it never contemplated having its road crossed in all directions by local roads that "could almost destroy it if they could be carried out." By way of sustaining the law moral obstruction to the Portage road has been applied by injunction, and physical obstruction in the form of engines, stout fences and large bodies of men. The latest news is that the injunction has been dissolved, and that "the feeling is very high against the Canadian Pacific." In the previous phases of this struggle the Canadian Pacific was clearly in the right. Its rights in Manitoba were a matter of contract, and the provincial authorities brought much discredit upon themselves by their violent methods. The result of the agitation, however, was the surrender by the Canadian Pacific of the "monopoly clause" for a very handsome cash consideration. A bargain was made and the Canadian Pacific apparently got the better end of it; but matters look now as if it were trying to postpone the delivery of what it has sold. The final outcome can hardly be doubtful, but the progress of the Red River Valley road may be delayed until this season's wheat crop is moved out of the province.

Two recent interviews with prominent railroad men have attracted a good deal of attention. Vice-President M. L. Sykes, of the Chicago & Northwestern, pointed out the fact that the Northwestern roads, while doing more business than last year, are doing it at such rates that they can hardly earn as much money. He attributes this unfortunate condition to the effects of the Inter-state Commerce act, and more particularly to the state legislation of Iowa and Minnesota. The publication of this interview furnished Gen. G. M. Dodge, a director of the Union Pacific, with a text for some extremely pertinent remarks. He did not deny any of the facts pointed out by Mr. Sykes, but undertook to show that the railroad companies are themselves greatly responsible for their own embarrassment. He thought that the low rates fixed by the states found their origin in the cut rates and special terms made by the roads in their wars. At the very time when the Iowa legislation was under consideration the roads were carrying traffic at rates below those fixed by the Iowa commission. But revenue is lost not only from low rates, but through loss of service of cars. Special privileges to shippers have gone so far that "the mileage on cars on the roads east of the Missouri is about half what it used to be ten years ago. . . . It is almost impossible to get a car through the city of Chicago under one week. . . . The Union Pacific is now doing a large amount of its business at a loss because its management has not the nerve to stand up and refuse it; it is fearful that some other road will get it." Of course General Dodge did not pretend to touch, in one brief interview, upon all of the difficulties of maintaining rates, or of keeping up a rational car service system under existing laws, but he did express very vigorously his ideas of some things which the roads might do to help themselves. He thinks that much of the present condition is due to the fact that the "managers of the roads have turned their business entirely over to the traffic managers, and the first duty that they owe to their stockholders is to divorce their operating and traffic departments." He would have demurrage charged on cars held over three days, and urges more attention to local business. The experiences of the traffic associations and demurrage bureaus are but moderately encouraging, and whether or not they can be successful without pooling is yet to be proved; but meanwhile it is wholesome for managers to realize that their troubles do not all begin with the legislatures.

Richmond Terminal and Georgia Central.

The Richmond & West Point Terminal & Warehouse Co. has startled the financial world by obtaining control of the Georgia Central system. This will give it an aggregate length of nearly 7,000 miles of railroad; a mileage not much inferior to that of the Atchison, and probably equal to that of any other existing system.

The growth of the company has been most rapid. Organized in 1880, as an auxiliary corporation for the Richmond & Danville, it attained great financial prominence in May, 1886, by becoming the virtual owner of the parent company. In January, 1887, six and a half million dollars of East Tennessee, Virginia & Georgia preferred stock was bought, giving control of that company for five years. This week the R. & W. P. has obtained control of the Georgia Company, which stands in a relation to the Central of Georgia not unlike that which the R. & W. P. originally bore to the Richmond & Danville.

The old Richmond & Danville lines were about 800 miles in length, including, besides the Richmond & Danville itself, the North Carolina, the Atlanta & Charlotte, and some others of minor importance. In 1886 and 1887 some 2,000 miles were added to the system, the most important additions being the Virginia Midland (413 miles), the Charlotte, Columbia & Augusta (373 miles), the Columbia & Greenville (296 miles), the Western North Carolina (290 miles), and the Georgia Pacific (401 miles).

The East Tennessee, Virginia & Georgia owns 1,006 miles of road, and operates 71 more; besides which it controls, by ownership of stock, the Mobile & Birmingham (150 miles), the Knoxville & Ohio (67 miles), and the Memphis & Charleston (330 miles).

The Central of Georgia directly operates, and practically owns, 1,219 miles of railroad; besides which its auxiliary system includes, among other railroads, the Western of Alabama (138 miles), Georgia R. R. (307 miles), Port Royal & Augusta (112 miles), Atlanta & West Point (87 miles), Port Royal & Western Carolina (229 miles). Part of these, it should be said, are operated jointly with the Louisville & Nashville.

The grand total of mileage thus consolidated, as nearly as we can ascertain it, is as follows:

Richmond & Danville	2,894
E. T., Va. & Ga	1,624
Central of Georgia	1,219
" " auxiliary system	984
	6,721

It is difficult to collect full returns as to the earning power of the consolidated system. We can only give the results of the most recent fiscal years of the more important companies.

	Gross earnings.	Net earnings.
Richmond & Danville (old lines)	$4,355,000	$2,067,000
Virginia Midland	1,635,000	583,000
Charlotte, Col. & Aug	826,000	304,000
Columbia & Greenville	559,000	102,000
Western North Carolina	661,000	84,000
Georgia Pacific	1,160,000	326,000
East Tenn., Va. & Ga	5,110,000	1,717,000
Memphis & Charleston	1,764,000	504,000
Central of Georgia	4,875,000	2,801,000
Georgia R. R	1,514,000	557,000
	$22,459,000	$9,115,000

The table just given includes more than 90 per cent. of the whole earnings, but many of the returns are for fiscal years ending Sept. 30, 1887, so that the actual present amount may be somewhat greater than is indicated by the table.

The aquisition of the Georgia Central can hardly fail to be a good thing for the Richmond & West Point. As its recently published report showed, the Central is in an exceptionally prosperous condition. It assures the Richmond & Danville a set of southern connections of the very best class, doing a profitable local business, and at the same time in condition to handle through traffic with economy. It also secures harmony of management just at a time when it was endangered by the Inter-state Commerce act. It is true that the Southern Railway & Steamship Association has maintained itself better than such organizations in the North; but the clause against pools was a standing menace to its continuance. The present consolidation, if it is really accomplished, secures harmony of action on the part of the railroads of the South Atlantic states, because the independent systems cannot afford to quarrel with a company by whose lines they are so thoroughly surrounded. As long as the Norfolk & Western had an equal chance for through connections, it was a dangerous rival to the Richmond & West Point; to-day its power for independent action on Southern traffic policy is much limited.

The chance for destructive competition is still further lessened by the fact that the Ocean Steamship Co., running from Savannah to New York, was owned by the Georgia Central and passes into the control of the Richmond & West Point. In case the Inter-state Commerce Commission attempts to enforce stricte compliance with the long and short-haul clause on the part of the Southern roads, as now seems likely, the possession of coastwise steamship facilities and terminals will prove of even greater importance in the future than it has done in the past.

Whether the change will be equally advantageous to the stockholders of the Georgia Central remains to be seen. That company, under the management of General Alexander, has achieved well-deserved success. Any radical change in its policy or in its officers seems highly undesirable. We trust, in the interest of all parties concerned, that no such change will be made. General Alexander's relations to the men who have carried out the recent financial operations have, we believe, been friendly, and he is quoted as saying that the result is a good one for the minority stockholders and for the city of Savannah. The best guarantee for such an outcome would be General Alexander's continuance in the presidency of the road.

The Size of Express Engine Driving Wheels.

The use of engines with a single pair of large driving wheels has been again mooted for running fast express trains. Such engines were at one time in use on many roads in this country, but it is doubtful if any are still running. The introduction of steel rails has taken place since this type of locomotive was abandoned here, and therefore if re-introduced now, the weight permissible on the single pair of drivers would be considarably greater than in the old days of iron rails. It must, however, be also borne in mind that the weight of cars and trains has also increased, and therefore the proportion between the adhesion of the single pair of drivers and the weight of the train would now be much what it was thirty years ago, provided that the weight placed on the drivers is not increased beyond the limits of safety and economy. Engines with a single pair of driving wheels undoubtedly present advantages for running fast trains of moderate weight on a road where the grades are fairly good, the permanent way is strong, and few stoppages or slackenings of speed are required. The adhesion of the four drivers is really needed only at starting, and when once the train is fairly under headway, the engine with the single pair of drivers will seldom slip if the sanding apparatus is in good working order.

Experience in Great Britain tends to show that in trains running long distances without stopping the highest speeds are there attained with engines with a single pair of drivers, and that the size of the driving wheel has considerable influence on the speed. In this country the conditions are generally unfavorable to single drivers and large wheels. The heavy trains and the frequent stops require considerable adhesion and tractive power. The former is best secured by coupling the wheels and the latter by making the wheels of moderate diameter. The tractive power of an engine with large wheels may, of course, be increased by enlarging the diameter or the stroke of the cylinder. Both these methods have, however, certain objections, and, therefore, generally the size of the cylinders is not materially increased in engines with large wheels. If the stroke of the pistons is materially lengthened, it is difficult to balance the moving parts, and the greater velocity of the piston, cross-head, etc., tends to cut the cylinder, piston-rods, packing and slide bars. The angularity of the connecting rod being increased, the thrust of the cross-head rubbing pieces on the slide bars is greater, and as the velocity is higher, the tendency to heat and cut is doubly augmented. If the diameter of the cylinders be materially increased, the strain on all the working parts is correspondingly augmented and the bearing surface of the cross-head, crank pin and driving axle-box should be proportionately increased, while due provision should be made for strength and the cross-section of the various parts increased where necessary.

The use of a large pair of single drivers limits the cylinder power, and this is especially noticeable at starting and at low speeds. When the engine is running fast, the smaller number of revolutions allow the steam more time to enter and leave the cylinder, and consequently the area of the diagram is not so much diminished by wire drawing and back pressure. If, for instance, we compare two engines with 18×24 cylinders, one having 5 ft. 9 in. drivers and the other 7 ft., the piston speed of the latter engine when running at 60 miles per hour would be the same as that of the smaller wheeled engine when running at 49.3 miles per hour. If the valve gear, cylinders, boiler pressure and point of cut off were similar, it is fair to assume that the diagrams would be of the same area when the valves and pistons are moving at the same speed. Consequently the large wheel engine when running at 60 miles per hour would exert 82 per cent. of the tractive power exerted by the other engine when running at 49 miles per hour, the difference in power being in proportion to the diameter of the drivers. If, however, both engines were running at the same speed of, say, 50 or 55 miles per hour, it is probable that the large wheel engine would, owing to the smaller amount of wire drawing, have the larger tractive force.

An examination of indicator diagrams will show that the decrease in tractive force is very considerable as the speed increases. In some indicator diagrams which appeared in these columns some time ago,* the average pressure in the cylinders of an express passenger engine fell from 97 lbs. at 17 miles per hour to 47 lbs. per sq. in. at 42 miles per hour, the valve gear giving the same cut-off and the boiler pressure showing little variation. On this locomotive running an express passenger train, an increase from 34 to 42 miles per hour in the speed showed an increase of 20 lbs per sq. in. in the loss due to wire drawing, back pressure, etc., the reversing lever being in the same notch in the quadrant. If this increase of 8 miles per hour in the speed diminished the pressure on the pistons 20 lbs. per sq. in., an increase of 11 miles, from 49 to 60 miles per hour, would probably diminish the effective pressure from 40 to 20 lbs. In other words, this apparently small increase of speed will in the majority of ordinary passenger locomotives halve the available tractive force. According to the diagrams above referred to, the total tractive force of the two engines selected may be compared as follows:

The engine with 7 ft. wheels, having an average pressure in the cylinders of 40 lbs. per sq. in. and a tractive force of 92.6 lbs. per lb. average pressure on the pistons, would have a total tractive force of 3,704 lbs. The engine with 5 ft. 9 in. wheels would have 20 lbs. average pressure in the cylinders and would exert 112.7 lbs. total tractive force for every pound per square inch pressure on the pistons. The total tractive force would consequently be 2,254 lbs., or about 61 per cent. of that of the large wheeled engine.

We may therefore conclude that taking two engines with similar cylinders, valve gearing and boiler pressure, but with different sized drivers, that the engine with 7 ft. drivers will exert considerably more tractive force at speeds above say 45 miles per hour than an engine with 5 ft. 9 in. wheels, though the latter will have a superiority at slow speeds, or in other words at starting and when ascending heavy grades.

It may of course be urged that the loss of pressure at the high speeds would be diminished by better valve gearing and larger ports and steam passages, or by compounding, whereby the same or a greater degree of total expansion could be obtained with a later cut-off, and consequently larger port openings. These improvements, however, need not be confined to the exclusive benefit of the small-wheeled engine, for they can be applied with greater ease to the large-wheeled engine, as the smaller number of revolutions will throw less work on the valve gearing. The small-wheeled engine would, however, within ordinary limits of speed, benefit most by these improvementt.

The question of increasing the size of wheel for express locomotives, is evidently largely influenced by the number of stoppages, or rather the distance which can be run uninterruptedly at full speed. The large wheel will lose in starting and getting under headway, but will gain when once high speed is attained, and consequently can only be used to advantage where the stoppages are few and the average distance which can be run at full speed without a check is at least 25 miles.

Some First Principles.

A correspondent who has been on the ground sends us some notes of interest concerning the Mud Run disaster, together with comments on certain points. He says: "Mud Run station is plainly in view from every point of the entire length of a single half-mile curve. On the inside of the curve flows the river, the lowlands offering no obstruction whatever to a direct view across the bend, the embankment being perhaps 25 feet above the water. The station is on the outside of the curve, and the edge of the embankment is so close to the track on the opposite side that there is no probability of the brakeman's danger signal having been obscured by a crowd of people from the halted train, as has been surmised. Engineer Cook *must* have seen the tail lights of the train if his eyes were open. The train was not under control, and for this Engineer Major of the second engine must be at fault. The air-brakes were in his

* See *Railroad Gazette*, page 624, Sept. 10, 1886.

charge, and, as Cook says, the first engine could not have used its steam-brake at the speed they were running, without danger of a wreck. Every precaution appears to have been taken by the management to provide for the safety of this great excursion. There is one lesson to be drawn from the evidence of Engineer Cook, which should not be permitted to pass without comment. That is, the fatal weakness in an emergency of doubling up engines, and throwing the responsibility of the train upon the two engine crews. It stands out in ghastly prominence in this case, and should form a topic for thorough discussion and eventual reform."

There is very little doubt, as was indeed apparent from the enginemen's testimony, that the division of responsibility between them was a contributing cause; but there is little profit in discussing that point when the true remedy, the application of the air-brake throughout, is so apparent. It may be said that Cook ought to have blown his whistle (directing Major to slacken) some distance back, even in the absence of danger; but before expecting this degree of intelligence of him it must be assumed that he knew the meaning of "Under control." It appears from his testimony that his ideas were hazy on that point. Besides, every one familiar with trainmen knows how pride, or a shrinking from ridicule (however slight), leads them to avoid any act indicating too great caution. Firemen hesitate to remonstrate with their superior, the engineer, even in the face of danger, because of the fear of displeasing him. "He is supposed to know his own business." The same was doubtless more or less true as between Cook and Major.

In the questioning before the coroner's jury there was much discussion as to the meaning of "running under control," but without throwing any light on the subject, and some of the trainmen made themselves out worse than they were. Running a train under control is running it at such a limited speed that it can be stopped within the length of track which can be seen to be clear. Under some circumstances a mile a minute would be under control; in others six miles an hour might be dangerous. The betrayal by so many men of such indefinite notions suggests the query whether instruction on this point is not needed among trainmen in general. Speed should be limited definitely (in miles per hour) wherever possible. Even this is a poor enough guide. At places where a runner is not used to stopping he is liable to make wrong estimates of the distance he can pull up in, especially if he be used to running only with hand brakes. The surest safeguard is to make him actually stop occasionally, even if a decoy signal has to be given for the purpose.

Another point illustrated at Mud Run is the danger of depending upon distant signals too implicitly. The men on that train saw an all-clear signal when they were 1,000 ft. away, more or less. It was somewhat as though there had been a distant signal 1,000 ft. from the home signal. But suppose a careless operator changes the home signal (at the station) from white to red after the train has passed the distant? Only the track circuit electric lock will properly provide against this. No ordinary circumstances justify such changing, but careful signal engineers make the instructions read "A clear distant signal indicates that the home signal *has been pulled* off" (to the clear position), not that it actually is off. In several recent cases the British Board of Trade inspectors have censured a runner for sighting a signal at a distance, then taking his eyes off the track ahead of him, and getting into trouble by the changing of the signal after he had looked at it, but before he had reached it. The principle of a distant signal is to place the warning at a point where the engineman can do something to avert danger after it has reached the signal. It is not in fogs and snow storms only that this signal is of value. Those other cases, which must happen, though perhaps rarely—those where the runner forgets to look as far ahead as he might but yet comes to his senses on seeing a danger signal immediately before him—are also provided for. The *principle* of a distant signal was recognized at Mud Run in the order directing trains to go 60 ft. beyond the station signal. It is recognized in block signal codes which require that a block never be cleared until the train has passed out of and 300 ft. beyond it. But neither 60 ft. nor 300 ft. is a safe stopping distance. Why should not more be allowed? It is doubtless very rare on most roads to have a fog which obscures objects 300 ft. away; this being so the approaching engineman and the signalman together have a view of 600 ft. In foggy weather, therefore, the speed must be within such limits that the train can be stopped in, say, a trifle more than its own length: Every one familiar with runners of fast trains knows that many of them are nervous when they are compelled to lose so much time as is necessitated by such slackening as this. The requirement to arrive on time fills so large a place in their minds that it sometimes overshadows all else, and leads to dangerous stretching of the speed-limit rules.

Some men of large experience regard the torpedo as of greater importance than is generally understood to belong to it. A correspondent, in another column of this issue (who, however, wrote before the Mud Run disaster), gives some pertinent hints concerning its use. If the torpedo were treated as the principal signal and the lamp as secondary the distance rule would be more faithfully adhered to, as a matter of course; for placing a torpedo within 60 ft., or even 300 ft., of an obstruction, would at once appeal to the average brakeman as absurd in the extreme. The regular flagging rule (No. 99, Uniform Code) recognizes the need of both visual and audible signals; but the weakness manifested in practice consists in the partial suspension of this rule. It must of necessity be suspended in many places and at many times; but defining these places and times, which is a delicate and important duty, is left too much to the brakeman.

Very likely if the engineers themselves had been on the left side of the engines and had seen the red light which the lookout men saw and remained silent, these sixty funerals would not have darkened the life of whole counties. An engineer acquires much of his alertness of eye and hand by experience after he takes charge of the engine. Firemen and brakemen have somewhat similar training, but it lacks an element which, though not definable in detail, may mean much. It is therefore apparent that placing temporary pilots on engines must be attended to with great care. The use of engines with separate tenements for runner and fireman involves an inconvenience which, to a runner with a green fireman, should be recognized as demanding special consideration.

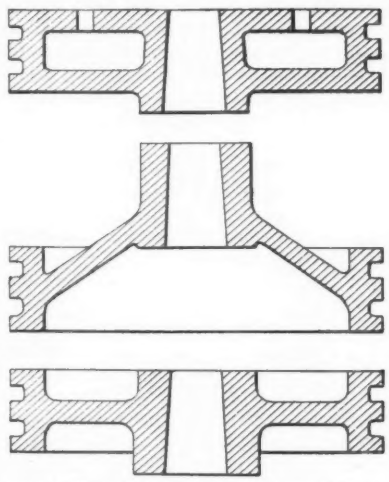
Another correspondent sends us some reflections on the tragedy, some of which were treated editorially, and others are based on wrong premises, the author having written before the facts were all out. One of his chief questions, however, is, Why were any of the trains stopped at this obscure station? The answer is that here was the beginning of a single track section, and a train had to be met. But perhaps this does not satisfy our questioner; he may say that the train-dispatcher should have arranged the running time and meeting points so that there would be no waiting. This is partially possible in theory, but in practice it is not so easy. There was one south-bound train to be met by the seven or eight north-bound trains. We do not know how many other meetings had to be made, nor how long it would have been practicable to hold the excursions at the starting point, but it may probably be assumed that the dispatcher did his best to run the trains so that all meetings should occur on double track. It would hardly be deemed reasonable to keep the south-bound regular train waiting at one place for all the excursion trains. And, as every one knows, unforeseen interruptions are peculiarly liable to disarrange trains at such a time as that under discussion.

Solid Pistons.

The advantages of a solid piston and plain packing rings are so obvious that it is somewhat surprising that the composite piston is still in such general use. A solid piston is cheaper, lighter, simpler and less liable to fail, and these advantages are surely substantial enough to warrant a fair trial, even if the solid piston possesses some countervailing drawbacks. It is, however, well to call attention to the relative merits of the three different types of solid piston in most general use, as shown by the accompanying diagrams.

The cored piston conforms to the ordinary piston in outward contour, and the cylinder covers can be made flat or nearly so. It is, however, doubtful if a flat cylinder head is either as strong or as little liable to spring as one with curves or corrugations which stiffen the flange and help to maintain a steam-tight joint. The cored piston is heavy, and the plugs, however tightly screwed into the vent holes, are apt to get loose and cause trouble on the road.

The conical piston is light and strong, a cone being capable of standing a considerably greater pressure than a flat disk. Pistons of this form have been used up to 92 in. diameter in marine engines, and have been very successful in locomotives. They are especially useful for long stroke cylinders, as the piston rod packing can be recessed into the cylinder, thus enabling the length of the connecting rod to be increased. The covers also are of a strong shape, and the projection in the front head is not in the way of the front truck wheels, and therefore does not occupy any useful space. This form of piston has, moreover, the advantage that the nut on the piston rod is easily got at by a long wrench and tackle when the cover is removed. It is therefore not unusual to make the piston rod and cross-head in one with this form of piston.* When the piston rod nut is taken off, the piston rod can be removed through the back cover. This saves keying



the cross head to the piston rod and enables the connecting rod to be lengthened a few inches.

The style of piston shown in the lowest diagram is also lighter than the cored piston and can be more easily cast, and is less liable to failure, which generally takes place by a crack commencing at the outer angle at the foot of the groove for the ring. The trouble is generally primarily caused by a combination of a badly worn cylinder and wet steam. The space behind the ring becomes filled with water, and when the ring is driven back upon it by the ridge at the end of the bore, the sudden pressure on the water acts like a blow and breaks off a piece of the piston from the groove. This trouble can, however, be avoided by proper precautions, and is hardly the fault of the form of piston.

With ordinary care and skill, solid pistons appear to give very satisfactory results. The rings require to be carefully fitted sideways in the grooves so that there is neither shake, which causes wear, or any liability to stick fast. Practice differs considerably as regards the size of the rings. The present writer has used three rings, each $\frac{3}{4}$ in. wide on the face, by $\frac{1}{2}$ in. thick, while Mr. W. A. Foster, of the Fall Brook Coal Co., uses two rings, each $\frac{5}{16}$ in. wide on the face bearing on the bore of the cylinder. Average practice certainly lies between these extremes, but care in fitting up and a choice of suitable metal are probably more important than mere dimensions.

September Accidents.

Our record of train accidents in September, given in this number, includes 68 collisions, 57 derailments and 3 other accidents; a total of 128 accidents, in which 46 persons were killed and 223 injured.

These accidents are classified as follows:

COLLISIONS:		
Rear	35	
Butting	21	
Crossing	12	
		— 68
DERAILMENTS:		
Loose or spread rail	1	
Broken bridge	5	
Defective switch	1	
Broken frog	4	
Broken wheel	1	
Broken axle	2	
Broken truck	2	
Broken cowcatcher	1	
Broken draw-bar	1	
Broken brake-rod	1	
Misplaced switch	4	
Bad switching	2	
Cattle on track	8	
Landslide	1	
Burned sleepers	1	
Accidental obstruction	1	
Malicious obstruction	2	
Unexplained	19	
		— 57
OTHER ACCIDENTS:		
Cylinder explosion	1	
Broken parallel rod	1	
Miscellaneous	1	
		— 3
Total number of accidents		128

The causes of collisions where given were as follows:

	Rear.	Butting.	Crossing.	Total.	
Trains breaking in two	5	..	..	5	7
Misplaced switch	1	2	..	3	5
Failure to give or observe signal	4	2	3	9	13
Mistake in giving or understanding orders	..	3	..	3	5
Miscellaneous	7	2	1	10	16
Unexplained	18	12	8	38	54
Total	35	21	12	68	100

* This form of construction applied to a small piston is illustrated in Figs. 151, 152, 153, *Recent Locomotives*. It is also used on pistons up to 19 in. diameter.

A general classification shows:

	Collisions.	Derailments.	Other.	Total.	P. c.
Defects of road	..	11	..	11	9
Defects of equipment	5	8	2	15	12
Negligence in operating	25	6	..	31	24
Unforeseen obstructions	..	13	1	14	11
Unexplained	38	19	..	57	44
Total	68	57	3	128	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other.	Total.	P.c.
Passenger	25	15	2	42	23
Freight and other.	99	42	1	142	77
Total	124	57	3	184	100

The casualties may be divided as follows:

Killed.	Collisions.	Derailments.	Other.	Total.	P.c.
Employés	15	14	..	29	63
Passengers	4	7	..	11	24
Others	3	3	..	6	13
Total	22	24	..	46	100
Injured:					
Employés	35	29	1	65	29
Passengers	84	70	..	154	69
Others	2	2	..	4	2
Total	121	101	1	223	100

Twenty-four accidents caused the death of one or more persons, and 24 caused injury but not death, leaving 70 (55 per cent. of the whole) which caused no personal injury worthy of record.

The comparison with September, 1887, shows:

	1888.	1887.
Rear collisions	35	37
Butting "	21	43
Crossing and other	12	3
Derailments	57	63
Other accidents	3	4
Total "	128	150
Employés killed	29	52
Others "	17	9
Employés injured	65	131
Others "	158	60
Passenger trains involved	42	66
Average per day:		
Accidents	4.20	5.00
Killed	1.10	2.03
Injured	7.40	6.37
Average per accident:		
Killed	0.360	0.407
Injured	1.742	1.273

The feature of the month is the number of serious collisions. About the middle of the month there were a half dozen bad accidents of this kind. Four of them were fatal, and two (rear) on prominent roads killed nine people between them, besides injuring over 40. In both these cases the accounts indicate that the fault was not with the foremost train, and it seems likely that the practice of making quick time between termini with freight trains, which is becoming more and more common, was largely responsible for them. In a rear collision on the 14th, a train specially designated as a "fast freight" was said to have run into a slower train. Speed is ordered increased nowadays without sufficient reflection. The air-brake is universally recognized in theory as one of the necessities, but in practice freight trains have for some time been run as fast as the engines can be made to draw them, with no means of stopping within two or three hundred rods. When the risk to life and to the road's reputation is considered, it may well be questioned whether a power brake should not be counted the first essential in any change of this kind. Freight train speed should in many cases be slackened instead of increased, until that safeguard is available. The running of a part of the freight trains at high speed prevents the effective restriction of speed of others. Recklessness on the part of the company encourages the trainmen to imitate it. If we take the view that these distressing collisions are simply the result of trainmen's blunders we are no better off. If it is to be assumed that the causes of rear collisions, like those at Waynesville and Rittman are incurable, who can have the conscience to increase the speed of freight trains? Superintendents must be wary of fast freight trains for the sake of their own reputations, at least until they can bring their men under more perfect discipline. The glory of running a train of stock 500 miles a day or of showing the best division speed-record between New York and Chicago may be obliterated in a moment by the blunder of a crew who have not been properly trained in the new responsibilities incident to running 40 miles an hour instead of 20.

The crossing collision at Lima, O., on the 4th, was one of the most dramatic of the month, the train at fault being a heavy one, which travels 131 miles at 40 miles an hour, with only one station stop. The accounts say the air brake failed, but the train was an hour behind time, and those who believe the Westinghouse automatic brake infallible, as well as those who know how strenuously runners exert themselves to make up time under such circumstances as these, will suspect that undue anxiety to "get there" was a main cause of the collision.

A typical difficulty in discovering the true cause of accidents appears in the case of a derailment of a passenger train on a prominent road this month. The train men said the speed was low, and that they knew of no cause unless it was a "spread rail"; the officers in charge of track knew of none unless it was "fast running." The road has the reputation of maintaining a very fine track, and the roadmaster is probably right, but of course an impartial decision must come from some higher tribunal.

At Struthers, O., a fireman on the Pittsburgh & Lake Erie was killed, Sept. 14, by jumping from his engine because of fear of a collision which did not take place. The fireman rolled back under the wheels, but the train stopped before it touched the caboose ahead. Near Lawrence, Kan., on the 27th, an Atchison, Topeka & Santa Fe freight was stopped so suddenly by the parting of an air brake hose that the rear brakeman, who was sitting in the cupola of the caboose, was thrown through the window on to the top of the car, injuring him considerably.

Near Marquette, Mich., Sept. 9, a passenger train, of which the air brakes became deranged, descended a steep grade so rapidly that the passengers became panic stricken, and some of them, according to the local papers, jumped from the train, though none were killed. The train was safely stopped by the hand brakes.

The importance of small things in mechanical engineering was the subject recently of an eloquent address from the President of the British Association, and the point was further demonstrated recently in this city. It is stated that the heat caused by the leakage of steam from the pipes laid underneath the streets is rapidly destroying the insulation of the electric wires recently laid in the underground conduits. Mr. Andrews, the President of the New York Steam Heating Co., states that the leakage of steam is due to a single thing. The engineer in laying the mains had used wooden wedges in keying up the pipes of the company, instead of iron wedges. The cost along the whole Broadway line of cast iron over wood would have been about $100. The wedges had decayed, the joints had been sprung, and that was the whole cause of the leakage. The company has already spent $250,000 in remedying this error, by which only $100 was saved. Mr. C. E. Emery, the former engineer of the company, states that the wedges were used instead of leveling up the top of the masonry supports with cement as he advised. In either case, the amount of money saved originally was infinitesimal in comparison with the subsequent repairs, and the importance of small things could hardly receive a stronger illustration.

The People's Rapid Transit Co., of which we have before made some mention, is still actively promoting its scheme for an elevated road through the city blocks, and now proposes to make loops to run near the down town ferries on both sides of the city. The following is published as the substance of a joint report on the plan by Mr. Walter Shanly and Prof. W. P. Trowbridge: "The general mechanical result of the whole design, completed as proposed, would be a first-class four-track high-level road from end to end of the city, south of Spuyten Duyvil, so placed in point of elevation as to cause the least possible inconvenience to owners or occupants of buildings, not encroaching upon or interfering in any way with the streets, and with curvature and grades alike so favorable as to allow of trains being run at the highest possible speed. Fifteen minutes between Spuyten Duyvil and Park Place would be quite within the possibilities such a railroad." They believe that the estimates of $45,868,772 for real estate, and $39,911,721 for the cost of construction are "safe and liberal." The odd dollars in these estimates give them an alluring appearance of precision which should not prejudice one against a scheme which surely has great merit if it can be financed.

The New York, Providence & Boston has introduced a time-saving device in charging the cylinders of its cars lighted by the Pintsch system. Formerly trains were held at Stonington until their reservoirs were filled, a proceeding which frequently caused delay. A car containing five large reservoirs has now been put into service and is charged at the Stonington gas plant in the company's yard, and taken to the terminus at New London, the passenger car reservoirs being charged while cars are waiting at that station, and obviating unnecessary delay. The passenger trains stand there between trips and can be charged without delay. This system of tank or reservoir cars is an essential part of the Pintsch system and enables the gas made at one gas-works to be distributed to the various points along the line where cars or trains stand for any considerable time. Unless some such method was used, all cars using the gas would have to be sent periodically to be charged at the station where the gas was made. This would be very inconvenient, as many cars never come near the headquarters in ordinary service.

The Swinerton locomotive, with polygonal drivers, first brought to notice about a year ago, has been somewhat altered and improved, and is now running on an Eastern road. The 210 flats milled on the treads of her drivers soon disappeared after running. The object of the inventor was to prevent slipping, and while this expectation is certainly not fully realized, the amount of slip is not excessive. This is probably due to the great weight, stated to be 19 tons, on the single pair of drivers. While sufficient adhesion is thus secured under ordinary circumstances, the excessive weight cannot fail to be damaging to the permanent way, and is apparently the cause of the driving boxes running hot. The Swinerton engine is therefore virtually a locomotive with a single pair of ordinary drivers of moderate size.

Compound locomotives have apparently proved very successful on the Northeastern (England), where 20 additional compounds for freight service are to be built after the system of Mr. T. W. Worsdell, who was for many years at Altoona and is now Superintendent Motive Power of the line referred to. The engines have six coupled wheels, and are inside-connected. Two cylinders are used, one high pressure, and one low, and are placed side by side with the valve faces on top. The saving in fuel, as compared with simple engines with the same boiler, wheels, valve gearing, etc., is about 9 per cent. As the additional cost is small, and the additional complexity and weight practically nothing, the advantages of compounding are very manifest.

A record of the punctuality of passenger trains on the Great Eastern (England) for the first six months of this year shows that, out of a total of 110,000 trains, over 56 per cent. were absolutely punctual, 37 per cent. were less than 5 minutes late, over 4 per cent. were more than 5 minutes but less than 10 minutes behind time, and less than 3 per cent. were more than 10 minutes late in arriving at their destination. These figures may be compared with a government return as to the unpunctuality of all passenger trains in the United Kingdom during one week in August, 1874, and is shown in percentages below:

		Late.	
	Punctual.	Under 5 min.	Over 5 min.
U. K., 1874	51	24	25
G. E. R., 1888	56	37	7

The block system has been considerably extended during this period, and though the weight and speed of trains has increased, the number of trains over 5 minutes late has considerably diminished, showing that a general use of the block system does not cause delay, but rather promotes punctuality when the staff are thoroughly acquainted with that method of working.

Accelerations in the speed of through trains have extended to the service between England and the Continent, which, both as regards number and speed of trains and steamers, has been much improved of late years. A further improvement will be made shortly. The International Sleeping-Car Company intend to commence running a "club train" between London and Paris early next year. It will leave each capital daily at 4 p. m., and perform the journey in 7 hours 15 minutes. A few years ago the minimum time for a train starting at fixed hours was 9½ hours, and the traveler had either to leave before 8 a. m. or spend a night on the train.

The accounts of the race from London to Scotland have attracted a good deal of attention to the subject, especially as regards the style of locomotive used. The president of an Ohio road contemplates ordering two express engines with a single pair of large driving wheels for his road. They will embody several novelties and be the first compound locomotives ever built in this country, the tandem compound tried on the Boston & Albany having been altered from an ordinary locomotive.

The writer of the communication on "The Road Foremen of Engines," which appeared in the *Railroad Gazette*, Oct. 12, calls attention to a typographical error. The semi-annual report made by the Road Foreman of Engines on the Pennsylvania, in which he indicates the character of the repairs that each locomotive is likely to require within six months, is called the "probabilities" report, and not the possibilities report, as printed.

The Erie, in promoting Division Superintendent J. H. Barrett to be "Superintendent of Transportation," has recognized the importance of the car-service department, the movement of and accounting for all cars being placed under the control of the new office. Certainly the Assistant General Superintendent, which Mr. Barrett appears to be, is none too high an officer to attend to this department.

The President of the Senate has appointed Senators Edmunds, Dawes and Faulkner, as members of the joint committee of the two Houses which will investigate the facts in the construction of the Washington aqueduct. It is stated further that the Secretary of War will appoint a court of inquiry to ascertain whether any further action may be necessary on the part of the War Department.

NEW PUBLICATIONS.

The Illinois Railroad Record is the title of a new monthly issued in Springfield, Ill., under the management of Mr. C. P. Dresser. The publishers say that it will be the aim of the paper to present, each month, carefully compiled and, as far as possible, official information regarding Illinois railroads, so as to fully advise the investor, manager, operator or onlooker of all that is being done of importance affecting these properties.

The first issue of the *Record* contains a table of 10,221 miles of main track in the state, and as the greatest railroad centre on the continent is included in the field which the new journal proposes to cover, it will not perish for lack of material, whatever may be its fate. We trust that it will escape the other and more insidious maladies which carry off so many promising journals in their early infancy.

The railroad article in the November *Scribner's* is "The Every-Day Life of Railroad Men," by Mr. B. B. Adams, Jr. The paper is what its title would indicate, a simple narrative of the homely life of the men in the subordinate grades of railroad service. The writer has spent his life among those of whom he speaks, and has not failed to see the heroic and pathetic, as well as the common-place elements in their lives and duties. The article is very cleverly illustrated by Frost.

Railway Life, a monthly published in Toronto, Ont., announces changes in the editorial management. Mr. Barnett, late President of the Master Mechanics' Association, will contribute a series of illustrated articles on Canadian railroad inventions. Mr. R. Patterson, of the Grand Trunk, will write some practical articles on shop management, etc.

TRADE CATALOGUES.

Messrs. Smith & Vaile, of Dayton, O., have just issued a new catalogue of steam pumps, pumping machinery and boilers. Illustrations are given of pumps in great variety as to capacity and in details, some of which are especially adapted for railroad use.

TECHNICAL.

Locomotive Building.

The Baldwin Locomotive Works have just completed the last of an order for 60 locomotives from the Philadelphia & Reading. They have also completed 20 of the 50 freight locomotives for the Pennsylvania, and have also recently shipped 30 locomotives to the Mexican National.

Several more passenger locomotives for the Southern Pacific were completed this week at the Cooke Locomotive Works of Paterson.

The Schenectady Locomotive Works is constructing 20 freight locomotives for the New York Central & Hudson River.

Car Notes.

The Barney & Smith Manufacturing Co., of Dayton, O., has completed the first lot of sixteen 50,000-lb gondola cars recently ordered by the Kansas City, Memphis & Birmingham.

Thirty more box cars have been completed at the Anniston works of the United States Rolling Stock Co. for the Central of Georgia.

A number of new caboose cars were completed at the Birmingham works of the Louisville & Nashville last week.

The J. G. Brill Car Co., of Philadelphia, have completed four passenger cars for the East Birmingham line.

The Jeffersonville Car Works are building 100 cars for the Louisville, St. Louis & Texas, and 300 dump cars for the East Tennessee, Virginia & Georgia road.

The Lehigh Car Manufacturing Co., of Stemton, Pa., has received an order for building 500 gondola cars for the Central of New Jersey. The company is at present building 275 narrow gauge cars for the Jaragua Railroad, of Cuba.

The Laconia Car Co is building for the New York, Lake Erie & Western 200 Eastman heater freight cars for the conveyance of bananas, fruit, etc.

The Ohio & Mississippi has received two elegant parlor cars from the Pullman Co. They are fitted up with chairs of the Scarritt Furniture Co., and will be run between Cincinnati and St. Louis.

The Gilbert Car Co., of Troy, N. Y., is building a number of new passenger cars for the New York & Harlem.

Joseph W. Sprague, President of the Ohio Falls Car Works, has transferred his interest in this company to J. L. Smyser, T. D. Stewart and M. Muldoon, of Louisville, Ky., for $150,000. He will shortly retire and go to Europe, Mr. Smyser succeeding him as president.

Bridge Notes.

Plans for a proposed bridge, which it is estimated will cost $9,000, have been submitted by the City Engineer of Leavenworth, Kan., to the City Council.

An iron bridge to be built across the Connecticut at Chesterfield, N. H., is projected.

Deane & Westbrooke, of Philadelphia, have the contract for building an iron bridge at Phœnix, R. I.

The Maine Central is to build a new iron bridge across Watts street, at Hallowell, Me.

The Berlin Bridge Co. has a contract for building a new bridge at Winsted, Ct.

Two new iron bridges are to be built over the Quinsigmond River, at Grafton, Mass.

The contract for erecting the new canal bridge at Bridge street, Albany, N. Y., has been awarded to Sturtevant & Kellar for $1,335.

Work has begun on the new bridge over the Savannah River, at Augusta, Ga.

The bids for the construction of a brige over the Little Catawissa River, at Ringtown, Pa., were opened by the County Commissioners, and were as follows: Dresher & Banks, Charles Gerhardt, P. J. O'Neil, Port Carbon. The contract was awarded to P. J. O'Neil.

At a meeting of the City Council of Philadelphia last week a bill was introduced to authorize the construction of a bridge over the Philadelphia & Reading Railroad at Second street, in the twenty-fifth ward.

Manufacturing and Business.

A new car-wheel foundry, to have a capacity of from 200 to 250 wheels a day, is being erected at East Chicago, near Hammond, Ind. The buildings will be of brick, with iron roofs, separated by steel trusses, and they will be equipped with hydraulic cranes, etc. C. A. Treat, of the C. A. Treat Manufacturing Co., of Hannibal, Mo., is one of the directors.

The National Paint Works, of Williamsport, Pa., report very large orders for cars and railroad work. They have also furnished paint for the following bridges: Marine Park Iron Pier for Boston; Harvard street bridge, Boston; Poughkeepsie bridge; Cincinnati & Covington bridge, at Cincinnati (the new railroad bridge of the Huntington system), and the Central Viaduct at Cleveland.

The Electro-Magnetic Boiler Cleaner Co. propose to increase their capital stock from $12,000 to $500,000, and purchase the rights of the Electric Boiler Cleaner Manufacturing Co., of Quincy, Ill.

The Railway Electric Car Lighting & Signal Co. has placed its lights in a number of new drawing room cars of the Pennsylvania Railroad, and has also equipped an additional train for the Intercolonial.

The new works of the Moore Manufacturing & Foundry Co, at Milwaukee, Wis., have been completed, and the offices will be transferred to them from Chicago on Nov. 1.

The following companies have been incorporated in Illinois: The Lansberg Brake Co., at Chicago, with a capital stock of $2,000,000, for the manufacture of air brakes; incorporators, Henry Heil, Frank Lansberg and G. W. Pfeiffer. The Sharpneck Journal Mfg. Co., of Chicago, capital stock, $1,200,000, for the manufacture of journal boxes; incorporators, S. A. Stevens, Legrand Smith and Pliny B. Smith. The Northwestern Railway Car Signal Co., of Chicago, capital stock, $5,000,000; to manufacture car signals; incorporators, C. P. Larned, R. T. Brewer and C. C. V. Reeve.

The Welsh Railroad Spike Manufacturing Co., of Lawrence, Kan., has been organized in Kansas to manufacture a patent railroad spike. Capital stock, $100,000. Directors: Artemus Welsh, L. N. Roberts, R. K. Tabor, James Norton, of Lawrence; H. M. Busch, of Kansas City.

The contract for lighting the new steamer "Puritan" of the Fall River Line has been awarded to the Edison Electric Light Co. There will be 1,600 lamps of 16 candle-power each, for which current will be furnished by four 400-light dynamos. Two "Straight Line" engines will be motive power for the plant. The steamers "Bristol," "Providence" and "Pilgrim" of this line are also lighted by the Edison system, Armington & Sims engines being used as driving power.

The Pennsylvania has contracted for a Sprague electric motor to operate a transfer table at the Altoona shops. One has been in use on the Chicago, Burlington & Quincy at at Aurora for a year.

The Sewall Car Heating Co., of Portland, Me., has opened an office in Chicago. J. H. Sewall will have charge of the company's shops for the West and Northwest.

Iron and Steel.

The Lewis Foundry and Machine Co., Pittsburgh, has nearly completed the 10-in. mill and shears for the McLean Railroad Spike Co., Fremont, O. The company has also an order for a complete rod mill for the American Wire Nail Co., Covington, Ky.

The Fox Solid Brace Steel Co., of Chicago, has been organized, with a capital stock of $500,000, by C. S. Holt, A. C. Wheeler and others.

The Norway Steel & Iron Co., of South Boston, Mass., are to close their works about Jan. 1. They employ about 500 men.

The Southwark Foundry & Machine Co., Philadelphia, is building an addition to its buildings of 136 × 107 ft., with a wing 100 × 57 ft. Two traveling cranes, one 30 tons and the other 50 tons, will be placed in the new works. They are at present at work on orders from the Pennsylvania Steel Works, Cambria Iron Works and the Norfolk and Brooklyn navy yards.

The Cambria Iron Co.'s new Bessemer steel works will be completed and ready for operation by Jan. 1. They will have a capacity of from 1,000 to 1,500 tons per day.

M. V. Smith, of Pittsburgh, has been appointed consulting engineer of the Union Steel & Iron Co., of St. Joseph, Mo., which has recently been organized.

William Tod & Co., of Youngstown, O., have orders for rolling-mill engines from the Lake Erie Iron Co., of Cleveland, O.; the Harvey Steel Co., of Newark, N. J., and specially designed engines for the tire mill of the Latrobe Steel Co., of Latrobe, Pa., of about 1,000 h. p. They are also building heavy rail straighteners, with engines attached, for the Johnson Steel Street Rail Co., of Johnstown, Pa., of the same type used at the Edgar Thomson Steel Works.

The Rail Market.

Steel Rails.—Sales by one Eastern mill of 23,000 tons for Eastern roads, and of 7,000 tons for a Southern road, for 1889 delivery, is reported. Orders for 4,000 tons 80-lb. rail, and for 6,000 tons of a lighter rail, will be placed this week. Quotations, $27.50@$28 at Eastern mill.

Old Rails.—Lots aggregating 1,000 tons have been sold at private terms to a Western manufacturer. Negotiations for other lots are pending. Quotations are $23@$23.50 for tees.

Continuous Heating.

The Sewall continuous steam heating coupler has been extensively used on the Chicago & Northwestern, and as it "has given excellent satisfaction in every respect," it will be adopted as the standard coupler of that road.

Sutherland's Gauge Cock.

R. D. Sutherland, Master Mechanic Boston, Revere Beach & Lynn, has invented and patented an improved boiler gauge cock, which he is applying to all the locomotives on his road. When the water gauge cocks become leaky, the steam can be shut off entirely from the gauge cock, which can then be taken apart and repaired without letting the steam run down in the boiler.

Natural Gas.

The Standard Oil Co. is drilling for natural gas near Harrisburg, Pa., and expect to strike it at a depth of about 3,000 ft.

The price of natural gas has been so increased in some districts in the vicinity of Pittsburgh, that it is claimed by the consumers that it is undoubtedly dearer than coal. The right of the natural gas companies to increase rates has been contested in the courts, and the suits will probably be carried to the Supreme Court.

Vulcanized Ties.

The Manhattan Elevated has had in use some three years a few ties treated by the process of the United States Wood Vulcanizing Co.

The results have been very satisfactory, and an order has been given for the immediate preparation of 1,000 more ties. The process consists in subjecting the timber to a high heat while under pressure, which retains and solidifies the sap in the wood and gives a firm and uniform texture and makes the wood impervious to moisture. Although this process has not been heretofore largely applied to timber for ties and structural purposes, it has been much used for lumber for cabinet work and interior finish. Several of the largest buildings recently built in New York have been finished with lumber treated in this way, and important orders have been filled for lumber to go abroad.

Master Car-Builders' Standards.

The following questions have been submitted to a letter ballot of the members of the Master Car-Builders' Association, with the results given after each question. One ballot was sent without a signature and therefore was not counted.

Running Boards.—To substitute the following for the present standard specification for running boards. The ends of the running boards of box cars to be made to project over the ends of the cars, so that the *minimum* distance between the ends of those on adjoining cars will not be over 12 in.; and that the running boards be made not less than 2 ft. wide, and made of three boards 7 by 1 inch. The projecting ends to be supported on two brackets, at each end of the car, made of ⅜ by 1¼ in. iron, with a hard wood cleat 3 by 1 in. on upper ends, fastened with one ⅝ in. bolt and nut in each bracket. The lower end of each bracket to be fastened to the end of the car with two ⅝ in. bolts and nuts.

The vote on this substitute for the old standard was 329 "yes" and 84 "no." The substitute is therefore adopted as a standard of the Association.

Ladders.—To substitute the following for the present standard specification for ladders. Each end of every box and stock car to have a ladder attached to it next to the corner, which is on the left-hand side when a person is facing the end of the car. The sides of the ladder to be made of two pieces of hard wood 3¼ in. wide by 1¾ in. thick, each piece to be fastened with four ⅝-in. bolts and nuts to the end of the car, the narrow sides of these pieces to be fastened against the car. The distance between the strips to be 15 in. Each ladder to have not less than five steps or rounds made of ⅝-in. round iron; each step to be fastened to the ladder sides with a ⅝-in. bolt in each end. The lower round to have a guard or projection, to prevent men from slipping when swinging around the end of the car to get on the step. A hand-hold to be attached to the top of the car roof parallel with the ladder rounds 15 in. from the end of the roof. The hand-hold to be made of ⅝-in. round iron, and to be not less than 17 in. long from centre to centre of bolt holes, and to be fastened to the car with two ⅝-inch lag screws.

The vote on this substitute for the old standard was 261 "yes" and 171 "no." The substitute is therefore defeated, not having two-thirds of the votes cast, as required by the constitution.

Steps.—To substitute the following for the present specification for standard steps. Two good substantial steps to be made of wrought-iron of ⅝ × 1¾ in. section to be fastened one to each side sill, next to the corner of the car to which the ladder is attached. The steps to be not less than 12 in. long, measured horizontally between the sides, and the tread to be not less than 8 in. below the bottom of the sill. The side of the step next to the corner of the car to be as near to the end of the car as is practicable. Each side of the step to be fastened to the sill with two ⅝-in. bolts and nuts. A hand-hold to be attached to the side of the car above each step—to be placed horizontally 2 ft. above the bottom of the sills. The hand-hold to be made of ⅝-in. round iron, 2 ft. long in the clear between the ends; to have 2½ in. clear space between it and the sides of the car; to be fastened with one ⅝-in. lag screw in each end, screwed not less than two inches into the framing. Another handle of the same size, and fastened in the same way, to be attached horizontally to the end of the car the same distance above the sills, and on the opposite side of the ladder.

The vote on this substitute for the old standard was 345 "yes" and 87 "no." It is therefore adopted as a standard of the Association.

Brake-shafts.—To substitute the following for the present specification for standard brake-shafts. The brake-shaft to be placed on what is the left-hand corner of the car when a person is standing on the track facing the end of the car. The ratchet wheel and brake-pawl to be fastened to a suitable casting attached to the roof. A railing or guard to be attached to the end and the roof of the car around the brake-shaft. The centre of the brake-shaft to be 20 in. from the middle of the car. The nuts on the ends of the brake-shafts to be secured by split spring cotters.

The vote on this substitute for the old standard was 312 "yes" and 102 "no." It is therefore adopted as the standard of the Association.

Axle for Cars of 60,000 lbs. Capacity.—To adopt the form and dimensions shown in fig. 3 (not given here) as a standard for axles for cars of 60,000 lbs. capacity.

The vote on this proposed standard was 224 "yes" and 307 "no." It is therefore defeated.

Dimensions for Stem, Dead-blocks and Carrier-irons of M. C. B. Standard Automatic Coupler.—To adopt the dimensions given in figures on figs. 4, 5 and 6 (not given here) as standards for stem, dead-blocks and carrier-irons of M. C. B. standard automatic car couplers.

The vote on this proposed standard was 325 "yes" and 185 no." and it is therefore defeated.

Oct. 12, 1888. M. N. Forney, Secretary.

Bridge Work on the New York Central & Hudson River.

The following contracts have been recently awarded by the New York Central & Hudson River Railroad Co.: To the Passaic Bridge Co., two spans double track iron bridge, 120 ft. each; to the Union Bridge Co., one span four-track, steel, 68 ft.; Hilton Bridge Construction Co., one span four-track, steel, 65 ft.

Bids are being received for one single track deck, plate-girder bridge, 110 ft. long; one single track, through, plate-girder bridge, 94 ft. long and one 50 ft. long; one lattice skew bridge, 170 tons. These are all of steel. A new bridge at Babcock street, Yonkers, of two spans, 75 and 50 ft., respectively, will be built next month, and the timber and iron bridges over Cayuga Lake will be renewed this winter. About 2,000 tons of steel for the depressed tracks through Harlem will be let in the spring. The company is considering the erection of a considerable amount of new bridge work with solid plate floors.

A contract has been made for a mile of metal cross-ties.

The company has decided to take out the plate girder bridges over Melvin brook, Clyde, and replace them with a stone arch. The work will begin at once.

Electric Lighting and Signaling.

That portion of the business of the Julian Electric Co. which belongs particularly to train service has been taken over by a new company, the Railway Electric Lighting & Signal Co. The business of car lighting will be pushed forward and some new applications of electricity will be introduced. An electric train signal is now offered. This is an idea which naturally follows the introduction of electricity on the train for lighting, as the pneumatic train signal followed the use of the air brake.

THE SCRAP HEAP.

Western Union Telegraph.

The annual report of the Western Union Telegraph Co. for the year ending June 30 is in many respects a remarkable balance sheet. It must be taken, first of all, as a good evidence of the productiveness of electrical inventions and investments that during the last 22 years the company has earned a sum of not less than $90,000,000, and has paid out over 50 millions in dividends, while the earning capacity of its property to-day is so great that it may be expected during the present year to pay as good a rate of dividend out of profits as at any time during its career. It is a remarkable fact that although at the present time the company stands practically without a rival, from the fact that it has a tariff arrangement with its only competitor, the Postal Co., there is no tendency to an increase in the charges made to the public. Since 1879 the business of the company has practically more than doubled, but in spite of this fact the profits of last year were but slightly higher than those of 1879, for the reason that the tariff has undergone steady reduction. At the present time, although the company has no longer to fight the competition of the Baltimore & Ohio Co., the average rate per message is only 31.2 cents, as compared with 30.4 cents in 1887; a very slight increase, especially when it is borne in mind that the average rate per message is 7 cents lower than it was before any active competition with the Baltimore & Ohio Co sprang up. In fact, looking over the table of rates for the 20 years from 1868 to 1888, we find that the average toll per message has fallen from 104.7 cents in 1868 to 31.2 cents at the present time, the lowest figure in the whole period, except last year. In the same period the average cost per message has fallen from 63.4 to 23.2 cents, so that so far as any benefit of reduced cost in operation is concerned, it appears all to have gone into the pockets of the public. These are facts which cannot be gainsaid, and while we would like to see the operators who do the work enjoy a greater share of the prosperity of the company, we do not think that the public has much ground for complaint. The Western Union is undoubtedly a big monopoly, built up by strenuous efforts, through long years of skillful management and diplomacy; but we cannot see that there is much to be gained by taking the business as it stands out of the hands of private individuals and placing it in the hands of other individuals who are paid salaries by the government.—*Electrical World.*

The Mud Run Disaster.

The coroner's jury at Mauch Chunk, Pa., has rendered the following verdict on the rear collision at Mud Run, Pa., Oct. 10: "We find that the engineers of locomotives Nos. 452 and 466 of the seventh section were guilty of gross negligence, first, in failing to discover the red signal in time, the evidence clearly showing that this signal was in full view as the train approached, and, secondly, for not approaching the station under full control, as required by both the general and special orders. The evidence also shows that the air brakes of the entire seventh section were under the control of the engineer of locomotive No. 466, and that he could have stopped the train in spite of the locomotive ahead, No. 452. We find that the lookout men of locomotives Nos. 452 and 466 were guilty of gross negligence in

failing to report to their respective engineers the red light at the station as the train approached. The men were placed on their respective engines as an additional precaution, their special duty being to look out for signals. The lookout man on No. 452 failed to see the signal. The other one, on No. 466, testified that he saw it when about 1,500 feet from the station, yet he reported all right to the engineer, and claims that he did not think the red light meant anything, as nobody used it. We find that the rear brakeman of the sixth section was guilty of gross negligence, for when his train stopped, instead of promptly going back the proper distance to warn the approaching train, he stopped at the station. There was time enough for him to have gone back nearly half a mile, but he went less than 400 ft. We find that the conductors of the two sections failed in their duty, the first in not conforming to the rule requiring each conductor to see personally that his brakeman protects the rear of his train, and the second in not requiring his train to approach the station under control."

The New York *Times*, in commenting on this verdict, says: "The look-out who saw the red light which warned of the danger ahead calmly explains his failure to call attention to it by stating that he did not know that it 'was ever used,' which, being interpreted, s mply means that he did not know the significance of the very signal that he was employed to watch for. It would be interesting to know how many more men are in the employ of the Lehigh Valley who know nothing of the requirements and duties of their places." If the *Times* had applied its question to roads in general, it would have hit the nail on the head. Those upon whom the Tower in Siloam fell were not sinners above all men. Other papers have made sensible comments in a strain similar to that of the *Times*.

The District-Attorney of Carbon County has issued warrants for the arrest of Cook, Major, Mulhearn, Pohl, Hannigan, Terry and Keithline, the last two being the conductors, charging them with gross negligence and wilful misconduct, and failing to observe the precautions and rules which it was their duty to obey. Cook, Major, Terry, Keithline, and Hannigan were arrested at Wilkesbarre, Tuesday, and taken to Mauch Chunk.

A Peculiar Accident.

Delia Dondican, an Irish immigrant, 18 years old, fell from the rear platform of a Long Island express on Oct. 18 and was killed. When she heard the name of her station called, the inexperienced and impatient girl arose and went out on the platform. There she lost her balance and pitched head first off the train, the customary guard chain across the rear platform being absent. She was still breathing when the train hands picked her up, but her neck was broken and she died in a few minutes. A coroner's jury censured the railroad company for not having had a chain across the rear platform of the car from which the girl fell.

Railroad Disaster in Italy.

A dispatch from Potenza, Italy, Oct. 21, says that 10 cars of a train carrying 400 people returning from the Naples fêtes were crushed in a remote portion of that district by a tremendous landslide. The telegraph line being broken by the fall of rock, help was delayed two hours. The scene that followed the disaster was horrible. 70 injured passengers and 90 dead were reported taken from the wreck. It is estimated that 200,000 cubic metres of earth fell upon the track. Potenza is in the southern portion of Italy and on a compartively new railr. ad line. Later reports reduce the number of casualties, the official statement showing 19 killed and 55 injured.

Railroad Men's Associations.

The Brotherhood of Railway Brakemen was in session last week at Columbus, O. The membership is 12,000, an increase of 3,000 during the year.

The Order of Railway Conductors held its twenty-first annual convention in Kansas City, Mo., Oct. 17.

At the National Convention of the Brotherhood of Locomotive Engineers in Richmond, Va., Rev. W. F. Crafts, of New York City, delivered a strong address, advocating the sending of a petition to Congress asking that laws be passed to forbid in the national mail and military service, in interstate commerce and in the District of Columbia and the territories, all Sunday traffic and work, except works of religion and works of real necessity. The engineers voted to favor the petition.

A Troublesome Guest.

Before the private carriage of the Emperor William arrived in Italy in his recent visit the Italian government caused a carriage of exactly the same dimensions to be built and sent to Bologna, and it made the journey from that place to Rome. There was apprehension that the Emperor's saloon carriage would not get through the numerous tunnels between Bologna and Florence; but it was found that the model just fitted.

Notes.

The switchmen in the yard of the Denver & Rio Grande at Pueblo, Col., struck on the morning of Oct. 22, the grievance being an objectionable superior officer.

Eleven conductors on the Rome, Watertown & Ogdensburg were discharged on Oct. 22.

The new union depot at Leavenworth, Kan., is to be opened for business Nov. 1.

The Cherokee division of the Missouri, Kansas & Texas, which shipped during the past ten months 10,329 cars of live stock, one-fifth more than the previous year, is now running stock trains from Denison, Tex., to Sedalia, Mo., in 23 hours. On the Cherokee division the schedule is made out at 26½ miles per hour. This is frequently bettered, trains overtaking passenger trains.

Hiram Umpleby, an engineer on a road in Pennsylvania, was seriously wounded in the shoulder a few days ago, while the train was running, by a bullet from a gun which was being experimented with by men in the express car.

A special train conveying officers of the New York Central ran over the Canada Southern Division of the Michigan Central on Oct. 16 in 4 hours and 36 minutes. From St. Thomas to Windsor, 111 miles, the net running time was 106 minutes. The train left St. Thomas at 8:37 and arrived at Windsor at 10:43, a stop of 20 minutes having been made.

A wholesale system of freight robbery has just been discovered on the Mexican Central, the total loss to the company being estimated at $50,000. Three conductors and one brakeman are in jail, and a former agent of the road named Smith, at Jimutco, has also been arrested. All of them are Americans.

—J. B. McClure, paymaster for a contractor engaged in building a new branch of the Lehigh Valley road, was brutally murdered about four miles from Wilkesbarre, Pa., Oct. 19. McClure had with him a companion, Hugh Flannagan, who was also killed, both men and their horses being riddled with bullets. They had with them $12,000 for paying off the laborers, which was stolen by the murderers. No clue to them has been found.

Four men have been arrested in Chicago for selling passes over the Chicago, Burlington & Quincy. The men came from the west in charge of cattle, and not desiring to go back sold the return stock passes to scalpers.

Honeymoon Cars in Spain.

The directors of Spanish railways may be excellent men of business, but they are certainly not students of human nature, as is shown by the following facts: A few months ago the model of a new railway carriage was put before them, divided into small, elegant apartments, each furnished with two seats and a small table, to be reserved for the special use of couples on their wedding tour. Innocent of the well-known fact that newly-married couples are always nervously anxious not to appear what they are, the delighted directors ordered some "honeymoon carriages," and for some time past one of them has been attached to every express train, with the result that not a single couple have yet made use of the special accommodation. A terrible rumor is now current to the effect that if the new vehicles do not gain favor, they will before long be set apart for the special use of "defrauders wishing to travel alone."—*Pall Mall Gazette.*

A Railroad to the Matterhorn.

The Matterhorn Valley is to be rendered more accessible by the construction of a railroad from Visp, on the Rhone Valley line, to Zermatt. The length will be 28 miles, and the line is to be opened for traffic in June, 1891.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In New York the Court of Appeals holds that by making and filing a map and survey of its proposed line of road and giving the required notice to all persons to be affected by the construction of the road, a corporation organized under the General Railroad Act of 1850 acquires (where no change of route is made as the result of any proceeding instituted by any landowner or occupant) the right to construct and operate a railroad upon such line, exclusive in that respect as to all other railroad corporations and free from the interference of any party. Injunction is the proper remedy in the case of the attempt of one railroad corporation to obstruct or interfere with the right of another such corporation to construct its road upon the line acquired by filing map and survey and giving notice.[1]

In Kentucky, the plaintiff, a subcontractor, entered into a contract with defendant, a railroad contractor, to furnish materials and construct the piling and trestling upon a portion of the road, which contract stipulated that in the event the railroad company failing to pay the monthly estimates of defendant, the latter should have the right to cancel the contract upon giving notice, and only be liable for labor and materials furnished up to the date of such cancellation. The railroad company subsequently made default in payment of the monthly estimates, and defendant notified plaintiff to stop work until further orders; that efforts were being made to secure a satisfactory adjustment with the railroad company, but pending these work was to be suspended along the entire line. The Court of Appeals decides that plaintiff, having ceased to work upon such notice to suspend, and not resuming it, must be regarded as having accepted it as a notice of cancellation of the contract, and, in an action on the contract, was not entitled to prospective profits which would have resulted from its completion. The Court also decides that under a contract by a subcontractor with a railroad contractor for the construction of a portion of the railroad, which provided, in the event of cancellation of the contract that the subcontractor should be paid for "labor done and materials furnished up to the date of such cancellation," the right of the subcontractor to recover for materials furnished was not restricted to such materials as had been delivered, inspected and received at the time of cancellation of the contract, but he was also entitled to pay for material procured or prepared to be furnished for the work.[2]

In Mississippi it is held that an agreement by a railroad to furnish bail for a detective in its employ, and pay all expenses in case he should be arrested in the cause of his employment, is not illegal, but where the detective was arrested and tried for being concerned in lynching a man whom he had caused to be arrested for wrecking a train, the detective's arrest not being the approximate result of the service, the company was not bound to furnish bail.[3]

Carriage of Goods and Injuries to Property.

The Charleston earthquake of 1886 set loose the waters of a pond near a railroad track and destroyed a number of horses in a car. The Supreme Court of South Carolina holds this the "act of God," discharging the carrier from liability.[4]

In Texas the Supreme Court rules that where a railroad company contracts to ship cattle on a certain day, it is liable for the damage resulting from a failure to do so, and cannot avoid the liability by showing that there was a washout on its road, caused by unusual rain, two days after the time for shipping, and after the time when the cattle would have passed the place of the washout had they been shipped according to contract.[5]

In South Carolina the Supreme Court holds that in an action for killing stock on the track, an instruction to the jury that if they believed the accident was avoidable by any degree of diligence, they should find for plaintiff, is erroneous, as a railroad company is held only to such diligence as a prudent man would bestow on his business, the absence of which is negligence, rendering the company liable to one injured thereby.[6]

In Illinois the Supreme Court rules that the inconvenience of having one's land temporarily thrown open by the construction of a railroad through it and the proximity of his fences, buildings, etc., to the track, and hence the risk of fire, are elements of damage to be compensated for in condemning the right of way.[7]

In a Mississippi case it appeared that some mules were in plaintiff's pasture, through which the railroad ran, in a depression near the track; that, as the train emerged from the cut, the mules were startled, and ran along the track ahead of the engine, and afterwards got upon the track; that the engineer sounded the cattle alarm and for brakes, and did all in his power to avert the collision, but failed, and the train struck the mules, and killed one, and the other jumped or was knocked from the track and killed. The Supreme Court decides that the railroad is not responsible.[8]

Injuries to Passengers, Employes and Strangers.

In New Jersey the Supreme Court holds that a passenger who has no ticket and will not pay fare may be forcibly ejected by the trainmen. If they call in a police officer, the latter becomes the company's agent, and the company is liable in damages if any of them use excessive force and violence toward the passenger. But if the conduct of the passenger is such as to constitute him a disorderly person, a policeman may by virtue of his office arrest him, notwithstanding the fact that the policeman was originally called in as an agent of the company; and for violence incident to such arrest the company and its agents are not liable.[9]

In Texas the car in which the plaintiff was stopped at night, and the brakeman called out the name of the station. The night was dark, and the plaintiff stepped off and fell through a trestle, the train not having reached the station. A verdict for $2,900 damages is affirmed by the Supreme Court.[10]

In a Missouri case an action for an injury sustained by a passenger from the sudden starting of a car, whereby he was thrown down, and his hand thrust through the car window and severely cut it appeared that he was sick from his injuries for several months, and was finally compelled to have his arm amputated just below the elbow, and that his expenses therefor were nearly $2,000; that his salary as a telegraph manager was $144 per month, and, being an expert operator, he occasionally made $50 per month extra; and that his value and usefulness as an operator had been impared to the extent of one-half. The Supreme Court holds that a verdict for $12,000 was not excessive.[11]

In Illinois an engineer invited a boy to get on his engine and take a ride, but seeing the yard master coming told the boy to get off, which he did; but the train being in motion he was injured. The Supreme Court holds the company liable.[12]

In North Carolina a brakeman was injured by the breaking down of a car platform on which he was standing. The Supreme Court affirms a judgment of $2,000 against the railroad.[13]

In Kentucky the Court of Appeals holds that in an action by an engineer of a passenger train for injuries received in a collision with a freight train, the railroad is liable where the accident was caused by the negligence of those in charge of the freight train.[14]

In the same state the ssame court rules that where a conductor controlling a train orders a new movement before his brakeman has a reasonable time to get from between the cars after making a coupling, it is gross negligence. A verdict for $10,000 (the brakeman having lost his foot) is affirmed.[15]

In Alabama the Supreme Court rules that on the trial of an indictment for murder caused by suddenly applying the brake to a hand car on which deceased, defendant and others were riding, whereby the car was stopped and deceased killed, an instruction that if defendant did not know the result of stopping the car suddenly, although he may have stepped on the brake in jumping off the car, he would not be guilty, is erroneous, as, if he knew that stepping on the brake would stop the car suddenly, and did so intentionally, he might thereby have been guilty of gross carelessness, which, causing death, would be at least manslaughter.[16]

In Kentucky a man was walking on the track as a train, approaching him from behind, whistled to indicate that it would stop at the station near by; he went upon the side track. The switch was closed at that time, but as the train passed the switch it switched off a car, which ran upon the side track by its own momentum. The engineer endeavored by whistling and shouting to attract the man's attention to the detached car. The conductor left the brake on the detached car and ran forward to shout at him, but failed to make him hear, and before he could regain the brake the man was struck. The Supreme Court holds the railroad liable.[17]

In Missouri the Supreme Court rules that one who crosses a railroad track in a city at a point 100 ft. distant from the street crossing, at an opening in a train of cars standing on the track, there being no evidence that such opening was made for pedestrians to pass through, or that it was ever used for that purpose, is a trespasser, and crosses at his peril.[18]

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1 R., H. & L. R. Co. v. N. Y., L. E. & W. R. Co., 13 Cent. Rep., 232.
2 C. & S. E. R. Co. v. Gray, 8 S. W. Rep., 876.
3 Hewlett v. C., N. O. & T. R. Co., 4 South. Rep., 547.
4 Slater v. South Car. R. Co., 6 S. E. Rep., 936.
5 G. C. & S. F. R. Co. v. McCorqurdale, 9 S. W. Rep., 80.
6 Molair v. Port Royal & A. R. Co., 7 S. E. Rep., 60.
7 C. & C. R. Co. v. Brake, 15 West. Rep., 149.
8 Y. & M. V. R. Co. v. Brumfield, 4 South. Rep., 341.
9 Jardine v. Penn R. Co., 12 Cent. Rep., 804.
10 Int. & G. N. R. Co. v. Eckford, 8 S. W. Rep., 679.
11 Dougherty v. Mo. R. Co., 8 S. W. Rep., 900.
12 C., M. & St. P. R. Co. v. West, 15 West. Rep., 171.
13 De Berry v. Car. Cent. R. Co., 6 S. E. Rep., 723.
14 Kentucky Cent. R. Co. v. Ackley, 8 S. W. Rep., 691.
15 L. & N. R. Co. v. Mitchell, 8 S. W. Rep., 706.
16 White v. State, 4 South Rep., 598. The defendant in this case was convicted of manslaughter and sentenced to imprisonment for two years.
17 L. & N. R. Co. v. Colman, 8 S. W. Rep., 875.
18 Dahlstrom v. St. L., I. M. & S. R. Co., 8 S. W. Rep., 777.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Baltimore & Ohio, Washington Branch, 5 per cent, payable Nov. 1.

East Tennessee, Virginia & Georgia, annual, 5 per cent, on first preferred stock, payable Dec. 10.

Nashua & Lowell, 4½ per cent., payable Nov. 1.

St. Paul & Northern Pacific, quarterly, 1½ per cent., payable Oct. 20.

Seaboard & Roanoke, 5 per cent., payable Nov. 1.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Brooklyn, Bath & West End, annual meeting, Brooklyn, N. Y., Nov. 8.

Brooklyn & Montauk, annual meeting, 120 Broadway, New York City, Nov. 7.

Carolina, Cumberland Gap & Chicago, annual meeting, Aiken, S. C., Nov. 6.

Central Massachusetts, annual meeting, Boston & Lowell passenger station, Boston, Oct. 31.

Cincinnati, Indianapolis, St. Louis & Chicago, annual meeting, Indianapolis, Ind., Oct. 30.

Downington & Lancaster, 233 South Fourth street, Philadelphia, Pa., special meeting Nov. 5.

East Tennessee, Virginia & Georgia, special meeting, Knoxville, Tenn., Dec. 22, to consider the approval of the lease to the Richmond & Danville.

Hudson Connecting, special meeting, Room 11, Mills Building, 35 Wall street, New York, Oct. 30.

Indianapolis, Decatur & Western, annual meeting, South Meridian street, Indianapolis, Ind., Nov. 6.

Philadelphia, Germantown & Norristown, annual meeting, Philadelphia, Pa., Nov. 5.

Poughkeepsie Bridge, special meeting, Room 11, Mills Building, 35 Wall street, New York, Oct. 30, to vote on a proposition to mortgage the road for $200,000.

Poughkeepsie & Connecticut, special meeting, Room 11, Mills Building, New York, Oct. 30, to vote on a proposition to create a mortgage for $1,000,000.

Raleigh & Augusta Air Line, annual meeting, Raleigh, N. C., Nov. 8.

Raleigh & Gaston, annual meeting, Raleigh, N. C., Nov. 8.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Association of Railway Chemists* will hold its next meeting in Baltimore, Md., Jan. 14, 15, 16.

The *New England Railroad Club* meets at its rooms in the

Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *Western Railway Club* meets the last Tuesday in each month in the Phenix Building, Chicago.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the second Thursday in each month.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the house of the Club, 1,122 Gerard street, Philadelphia.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at Pittsburgh, Pa.

The *Engineers' Club of Kansas City* meets at Kansas City, Mo., on the first Monday in each month.

The *Civil Engineers' Society of St. Paul* meets at St. Paul, Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month.

Western Society of Engineers.

A regular meeting was held Oct. 10. Mr. L. P. Pennypacker, of Chicago, was proposed for membership, and the resignation of Mr. C. F. Carl Bender, of Cleveland, was accepted. Written discussions of Mr. Wisner's paper on "Levels of the Lakes as Affected by the Proposed Lake Michigan and Mississippi Waterway," were presented from six different people in various parts of the country, and the secretary was authorized to prepare these discussions for publication.

Boston Society of Civil Engineers.

A regular meeting was held Oct. 17. President Fitzgerald was in the chair, 39 members and 10 visitors being present. Messrs. Edgar P. Selew and Charles W. S. Seymour were elected members. A resolution was offered by Mr. Swan, and adopted, directing the Secretary, as an experiment, to use the 24 hour system in the notices of the Society until otherwise instructed. A paper by Henry H. Carter, on the Construction of Farm Pond Aqueduct, was read by the Secretary, and was discussed by several members. Mr. Richard A. Hale exhibited a Barrenburg pump, and read a paper giving the results of tests made by him of its efficiency. Mr. Frederick Brooks read portions of a paper on Time Reform, with special reference to the 24-hour system.

Engineers' Society of Western Pennsylvania.

At the meeting of Sept. 18 the paper of the evening was by Mr. E. J. Aikman, on the "Janney Coupler." Mr. Aikman described the coupler in detail and showed blue prints. Speaking of the freight coupler he said: "What is designated as the coupler, *i. e.*, the head and barrel, is made of malleable iron and weighs 148 lbs. The knuckle or hook in freight service is an hydraulic forging, in passenger service it is made of cast steel. The knuckle pin or pivot on which the knuckle rotates, is of crucible steel 1⅝ in. diameter. The drop pin that holds the knuckle in position when coupled is of malleable iron, as are also other small pieces. The weight of a coupler complete is about 210 lbs., or 420 lbs. per car, and the cost is $25 per car, including all parts necessary for the uncoupling rig."

The passenger coupler is now in use on 150 different lines. Its price is $190 per car, including all necessary parts. The price of the Janney-Miller combination coupler is $150 per car. The paper was discussed by several members, but nothing of especial interest was brought out.

At a meeting Oct. 16 Col. T. P. Roberts read a paper on "The Railroad Situation in Pittsburgh, with Reference to Its Approaches."

"Crowded as the city is," he said, "between hills rising almost to the dignity of mountains, on the narrow margins of rivers, every inch of which is utilized by great producers of freight, it seems almost as though the limit of railroad development has been reached. We are, unfortunately, situated on one of the great natural highways of commerce in one respect. There is little advantage in having other people's freight blockade our streets. The conformation of the country is such that no first-class freight route can be made to avoid the Pittsburgh gauntlet. A circular railroad around Pittsburgh, with a radius of eight miles, even with tremendous concessions in the way of elevations and grades, would involve twenty-six tunnels, varying in length from a few hundred feet to one and three-quarter miles, and one and one-half miles of river bridging averaging 200 feet in height. Such a road would then fail to meet most of the roailroads at grade. It is simply impossible to go around the built-up limits of Pittsburgh with an intercepting railroad unless we make such a road nearly a continuous tunnel."

Colonel Roberts proposed to build up the river banks for railroad track uses. The volume of water, he thought, was not greater than before the settlement of this region, and since then the Monongahela had widened 300 ft., and the others proportionately. The Ohio, he thought, could be narrowed one-half without danger from floods, but that would interfere with navigation. He, however, saw no reason why the width of the Monongahela should not be reduced, and thought six side tracks could be carried down the left bank of the Monongahela and as many down the right bank of the Allegheny. The only objection was the river line established by law, but he thought that might be changed. The paper will be discussed at the next meeting of the society.

American Society of Civil Engineers.

A regular meeting was held Oct. 17, Vice-President Croes in the chair. The nominating committee presented the following ticket:

For *President*, M. J. Becker, Pittsburgh, Pa.; *Vice-Presidents*, A. Fteley, New York City; E. L. Corthell, Chicago, Ill.; *Treasurer*, George S. Greene, Jr., New York City; *Secretary*, John Bogart, New York City. *Directors*: Chas. B. Brush, Hoboken, N. J.; Elliot C. Clarke, Boston, Mass.; Walter Katté, New York City; Robert E. McMath, St. Louis, Mo.; William P. Shinn, New York City.

The Nominating Committee consisted of Messrs. William G. Hamilton, A. Dempster, Wm. B. Knight, A. B. Rogers, and F. P. Stearns.

The Secretary read a paper by Mr. J. D. Schuyler on the Construction of the Sweet Water Dam, San Diego, Cal. Some particulars of this dam were given in the *Railroad Gazette* at the time of the completion of the work last spring. It is 90 ft. high, 12 ft. thick at the top and 46 at the bottom, and the plan is on a compound curve, 822 ft. radius in the centre and with flanking curves 117 ft. radius. The total cost, including labor, material and engineering, was $234,070, and the cost of masonry complete was $8.80.8 per cubic yard. The paper was discussed by several members.

American Association of Railway Chemists.

This association will hold its next meeting in Baltimore, Jan. 14, 15 and 16, and not in October, as has been announced.

PERSONAL.

—Joseph W. Reinhart has been appointed General Auditor of the entire Atchison, Topeka & Santa Fe system, the duties of J. P. Whitehead as Comptroller requiring his entire attention.

—Brainard Bennett, who has been Division Roadmaster of the New York Central & Hudson River for the last 18 years, died at his home in Canadaigua, N. Y., on Oct. 16, after a short illness.

—Gen. James Craig, a leading citizen of Missouri and the first president of the Hannibal & St. Joseph, the first railroad built across the state, died suddenly in St. Joseph, Oct. 21, aged 74 years.

—J. H. Barratt, Superintendent of the Eastern Division of the New York, Lake Erie & Western, has been appointed Superintendent of Transportation. W. W. Steans, Superintendent of the Eastern Division of the Central of New Jersey, has been appointed to succeed him as Division Superintendent.

—Mr. J. A. L. Waddell, of the firm of Waddell & Jenkins, Consulting Bridge Engineers, of Kansas City, Mo., has received from the Emperor of Japan the Order of the Rising Sun, with the rank of Knight Commander. This is in recognition of professional services while in the employ of the Japanese government at the University of Tokaio.

—Col. R. M. Pulsifer, for many years one of the proprietors of the Boston *Herald*, died in his country home at Islington, Mass., Oct. 20. Col. Pulsifer was President of the Marietta & North Georgia Railroad and one of its largest stockholders. He was a stockholder in the Nantasket Beach and the Mexican Central roads and in telephone and electrical companies, also many Southern enterprises.

—Oscar G. Murray, whose resignation as Freight Traffic Manager of the Missouri Pacific, to accept a similar position on the Cincinnati, Indianapolis, St. Louis & Chicago and Chesapeake & Ohio, we announced last week, has been General Passenger Agent of the Gulf, Colorado & Santa Fé, Traffic Manager of the Missouri Pacific lines in Texas and Traffic Manager of the Texas & Pacific. He has held his present position since July, 1886. He will enter upon his new duties Nov. 1.

—A. S. Dodge has been appointed General Freight Agent of the Missouri, Kansas & Texas, and Gaston Meslier has been appointed General Passenger Agent. Mr. Dodge is at present General Freight and Passenger Agent of the Kansas City, Wyandotte & Northwestern. He was previously General Passenger Agent of the St. Louis, Arkansas & Texas. Mr. Meslier was Southwestern Passenger Agent of the Wabash for some time, and is now Assistant Passenger Agent of the Missouri Pacific.

—Edward Gallup, Assistant General Manager of the Lake Shore & Michigan Southern, died of pneumonia in Cleveland, O., Oct. 22, after an illness of ten days. Mr. Gallup was born in Brooklyn, Conn., Aug. 20, 1842. He was appointed Passenger Agent of the Ohio & Mississippi, at Cincinnati, in April, 1869, and became successively General Passenger Agent of the Kankakee Line, joint agent of Kankakee & Pittsburgh, Cincinnati & St. Louis pool at Chicago, General Passenger Agent, Assistant General Superintendent and General Superintendent of the Boston & Albany, and Dec. 1, 1886, he was appointed Assistant General Manager of the Lake Shore & Michigan Southern.

ELECTIONS AND APPOINTMENTS.

Anniston Terminal.—The incorporators are: A. I. Tyler, D. T. Parker, J. M. McKleroy, S. E. Noble, F. M. Hight, J. E. Goodwin and James W. Lapsley, all of Anniston.

Atchison, Topeka & Santa Fe.—The duties of the office of Comptroller requiring his entire attention, Mr. J. P. Whitehead has resigned the office of General Auditor and Mr. Joseph W. Reinhart has been appointed to that office, his appointment taking effect Nov. 1, 1888. Mr. Reinhart's office and address will be at 95 Milk street, Boston.

Bedford & Seymour.—The incorporators of this proposed Indiana railroad are Louis Schenck, Lynn Faulconer, F. M. Swope, Richard F. White, C. C. Isaacs, Merdy S. Blish, B. F. Price, Charles Leininger, Travis Carter, all of New Albany, Ind.

Central of New Jersey.—W. H. Peddle has been appointed Superintendent of the Central Division, with office at Elizabeth, N. J., vice W. W. Stearns, resigned.

Chicago & Eastern Illinois.—S. W. Drew has been appointed Chief Train Dispatcher and Superintendent of Telegraph of this road and the Chicago & Indiana Coal. G. B. Brimson has been appointed Superintendent of Transportation to succeed Mr. Drew.

Chicago, Milwaukee & St. Paul.—The division officers of the Kansas City line have been removed from Kansas City, Mo., to Chillicothe, Mo. H. R. Williams is the Superintendent of the division, and H. B. Earling, Train Dispatcher.

Cincinnati & Muskingum Valley.—F. M. Wilkinson has been appointed General Freight and Ticket Agent, with office at Zanesville, O., vice George W. Davis, resigned.

Columbus, Springfield & Cincinnati.—The following directors were elected at a recent meeting in Columbus, O.: J. S. Farlow, Isaac Fenno and Jacob M. Pierce, of Boston; J. A. Jeffrey, Columbus, O., A. S. Bushnell and J. H. Thomas, Springfield, and J. L. Moore, Sandusky. The Board: J. S. Farlow, President; Isaac Fenno, Vice-President, and J. L. Moore, Secretary and Treasurer.

East Tennessee, Virginia & Georgia.—The authority of Col. T. M. R. Talcott, First Vice-President, in charge of traffic, and Maj. Peyton Randolph, General Manager of the Richmond & Danville, has been extended over this road. C. H. Hudson has been made General Superintendent in charge of the transportation and maintenance department; William Hawn, Auditor, in charge of the accounting department, and James N. Mitchell, Acting Treasurer.

Grand Rapids & Indiana.—D. W. Mooar, Car Accountant and Distributor, has resigned, and on Nov. 1 the department will be transferred to the charge of C. E. Gill, General Freight Agent, with office at Grand Rapids, Michigan.

Gulf, Colorado & Sante Fe.—B. F. Booker has been appointed Engineer of Roadway, Bridges and Buildings, with office at Galveston, Tex., vice J. W. Clarke resigned.

Livermore Valley.—The directors of this California company are as follows: J. N. Knowles, Israel Lawton, I. W. Taber, E. Dunham, D. Gutmann, George W. Comegye and B. Noyes.

Los Angeles & Glendale.—The following are the incorporators of this company: H. J. Crow, of Glendale, President; R. Rogers, of Garvanza, Treasurer: B. F. Patterson, E. F. Byram, of Glendale, and B. E. Ward, of Los Angeles, Directors.

Missouri, Kansas & Texas.—P. A. S. Dodge has been appointed General Freight Agent, Gaston Mersler General Passenger Agent, and S. K. Bullard Superintendent of Telegraph.

George G. Pollock, Chief Clerk in the Treasurer's office of the Missouri Pacific, has been appointed Auditor. The general offices of the Receivers will be in Sedalia, Mo.

Nashville & Decatur.—The following directors were elected at the recent annual meeting in Nashville: D. B. Cliffe, Franklin; J. E. Washington, Cedar Hill; W. M. Duncan, T. O. Harris, John Orr, Samuel Seay, J. H. Thompson, J. C. Collius, Byrd Douglas, John Ramage and W. W. Berry, Nashville; Lucius Frierson, Columbia; T. M. Jones, Pulaski; W. R. Pryor, Athens, Ala. The directors re-elected D. B. Cliffe, President, and George W. Seay, Secretary.

National Association of Local Freight Agents' Associations of America.—The following officers were elected at the annual meeting in St. Louis: L. W. Campbell (Chicago, Milwaukee & St. Paul), President; P. A. Barnard (Ohio & Mississippi), Vice-President; John J. Baulch (St Louis Bridge & Tunnel Co., St. Louis), Secretary; F. L. Vieregg (Atchison, Top ka & Santa Fe, Kansas City), Treasurer.

New England General Ticket and Passenger Agents' Association.—The following officers were elected at the semi-annual meeting: President, J. A. Fenno, General Ticket Agent Boston, Revere Beach & Lynn; Vice-President, E. C. Watson, General Ticket Agent Connecticut River; Secretary, C. A. Waite, Boston & Maine. The Executive Committee was increased by the addition of C. T. Hempstead, General Ticket Agent New York, New Haven & Hartford.

Northeastern.—The annual meeting of the stockholders was held in Athens, Ga., Oct. 17, and the following officers were elected: President, Pope Barrow; Vice-President, R. K. Reeves; Directors, H. Beansse, A. K. Childs, George E. Deadwyler, E. R. Hodgson, A. T. Inman, R. Nickerson, C. G. Talmadge, T. J. Carr, Julius Cohen, J. S. Hamilton, J. H. Inman, T. M. Logan, J. M. Orr, S. Scott, J. White, G. C. Yancey.

Northern Pacific & Manitoba.—Herbert Swinford has been appointed General Agent at Winnipeg in charge of both freight and passenger business.

Ottawa, Waddington & New York Railway & Bridge Co.—At a meeting in Ottawa last week, the following directors were elected: W. J. Anderson, James Redington, Alexander Farlinger, J. J. MacCracken, Mrs. Grace Keefer and Charles Edell.

Pomeroy, Middleport & Syracuse.—J. C. S. Taber has been appointed Chief Engineer, with office at Pomeroy, Ohio.

Seaboard Air Line.—F. W. Clark is now General Freight and Passenger Agent of all the lines embraced in this system. His headquarters have been removed from Raleigh, N. C., to Portsmouth, Va.

Union Pacific.—J. E. Murden has been appointed Acting General Freight and Passenger Agent in Chicago, vice J. M. Bechtel, resigned.

West Stockbridge, Mass.—The following are the names of the directors: W. H. Starbuck, J. A. Bostwick, J. L. Macaulay, M. E. Stone, New York, and W. H. Stevenson, Bridgeport, Conn.

OLD AND NEW ROADS.

New Companies Organized.—Anniston & Terminal, Bedford & Seymour, Livermore Valley, Los Angeles & Glendale, Summit County.

Abemarle & Raleigh.—The extension surveyed easterly from Williamston to Plymouth, on Pimlico River, a distance of 22 miles, is reported under contract.

Anniston Terminal.—A declaration of incorporation has been filed in the office of the Secretary of State of Alabama. The terminal points of the road will be as follows: On the south at the point where the East Tennessee, Virginia & Georgia crosses the southern boundary of Anniston; on the north at the point where it crosses the northern boundaries of the city, and on the west at the point where the Georgia Pacific crosses the western boundary of the city. It will have tracks running into and through the city of Anniston, making connection with the other roads that run through the city. The capital is placed at $250,000.

Atchison, Topeka & Santa Fe.—The following is the circular of President Strong to the stockholders, concerning the present condition and needs of the property, sent out from Boston last week:

"The additions to the system by new construction since Jan. 1, 1886, are as follows:

	Miles.
Chicago, Kansas & Western	941
California Central	269
California Southern	211
Chicago, Santa Fe & California, including Pekin division	494
Denver & Santa Fe	124
Leavenworth Northern & Southern	46
Southern Kansas, Gulf Division	271
Southern Kansas of Texas	100
St. Joseph, St. Louis & Santa Fe	97
St. Louis, Kansas City & Colorado	57
Sundry small additions in Kansas and Colorado	86
Kingman, Pratt & Western, jointly owned with the St. Louis & San Francisco	80
Total	2,776

During the same time new locomotives and other rolling stock have been added to the amount of $7,263,000. The new construction is substantially completed, and the company now owns, exclusive of its interest in the Atlantic & Pacific and the roads in Kansas owned jointly with the Union Pacific and St. Louis & San Francisco companies, 6,531 miles of railroad. Its bonded indebtedness on the above mileage, exclusive of the income bonds of the California Southern and the Chicago, Kansas & Western, averages less than $20,850 per mile, and the capital stock is less than $11,500 per mile.

"The property is in excellent condition, well equipped with rolling stock, shops, stations, yards, terminals and necessary facilities for handling its present volume of business, and the company owns valuable coal mines in Kansas, Colorado and New Mexico. The poor crops of 1886 and 1887, the strikes and general labor agitation, the Inter-state Commerce law

and the "war of rates" have reduced largely the earnings of the past ten months and necessitated reduction of dividends. The closing up of this new construction comes in a trying period. The accounts of the company rendered to us this day by the comptroller show that the present net floating debt does not exceed $5,000,000 (exclusive of $1,400,000 for 3,000 coal cars, payable in installments from Dec. 1, 1888, to June 1, 1891).

"It has been decided to postpone the funding of this indebtedness until a more prosperous time, when it can be done without undue sacrifice. Meanwhile, to protect the company, a guaranty fund of $7,000,000 has been fully subscribed, the money on which will be called to any extent which may be necessary. For any money which they may be called upon to pay, the subscribers will receive the company's notes bearing interest at 6 per cent. per annum, running three years, but with the privilege of prepayment reserved. The subscribers will take these notes at par less a commission of 2½ per cent. It is believed that this quantity is ample in connection with net earnings to fully protect the liabilities of the company as they mature. It is agreed that if any necessity should arise, the amount of these notes may be increased so that there shall be not exceeding $10 000,000 in all. These notes are secured by a second mortgage of the Atchison main line in Kansas and the deposit of the Chicago, Santa Fé & California line and terminal stocks with the Boston Safe Deposit Trust Co., trustee. It is hoped that the railroads have learned from their experience that rate-cutting is destructive to all The rates are already partially restored, and efforts are making for entire restoration. The general outlook for business is improving. The new lines are well located, and, with time and economical management, will become profitable."

Bedford & Seymour.—This road has been corporated in Indiana, under an old charter, to run in as direct a line as be possible from Bedford to Seymour. Surveyors have already been placed in the field.

Birmingham Mineral.—Tracklaying on the Huntsville branch was completed last week to the present terminal point, four miles south of Chepultepec, Ala.

Burlington, Cedar Rapids & Northern.—The second mortgage bondholders, who were not parties to the foreclosure in 1876, are trying to obtain the right to redeem, and claim that payment of $7,000,000 gives them this right. The Master in Chancery and the purchasers at that foreclosure claim that they must pay $13,000,000. The second mortgage bondholders claim that the difference in figures arises from excluding and not requiring the present owners to account for proceeds of through business over the main line, or of any business from or to points on the main line to or from points on the branches; no allowance is made for the expense of doing this business, and all the proceeds of the business is given to the present owners without requiring them to pay the expense incurred in doing the business over the main line which is sought to be redeemed. The disallowance of 1,400 second mortgage bonds by the Master is also objected to. The United States Circuit Court at Des Moines heard the arguments, and will decide between their figures.

Central of Georgia.—The extension from Clayton southerly to Ozark, in Dale County, a distance of 35 miles, has been completed and opened for traffic.

Chicago, Kansas & Nebraska.—Dispatches from El Paso, Tex., state that the company will at once build an extension from Liberal, Kan., to White Oak, N. Mex., and connect at that point with the Kansas City, El Paso & Mexican, now building from El Paso to White Oak. Liberal is the present end of track in No Man's Land.

Chicago, Milwaukee & St. Paul.—A short branch, 5½ miles long, has been built from Alva, via Lapham Junction, to Withee and Zeda, Wis. The cut-off between Marion and Cedar Rapids, Ia., has also been completed.

Cleveland & Canton.—The road has now been changed to standard gauge from Cleveland to Canton, O., 60 miles, leaving 55 miles to complete the work to Coshocton.

Cleveland, St. Louis & Kansas City.—Grading was commenced last week at a point opposite Alton, Ill., and it is expected to have 12 miles between that point and St. Charles, Mo., completed before spring. The contract for building the road from Alton to St. Charles, on the Missouri River, has been let to S. H. Easton & Co., of Burlington, Ia. No steps have yet been taken toward the construction of the proposed bridge at Alton.

Colorado Midland.—The extension from Glenwood to Newcastle, a distance of 12 miles, has been completed and was opened for traffic Oct. 20. Corey Bros., of Ogden, Utah, were the contractors.

Dayton & Farmsdale.—The contract for building the road from Dayton to Farmsdale, Ala., 8 miles, has been let to King & Hannon, and work is to be commenced by Nov. 10. R. W. Price, of Dayton, is President.

Downingtown & Lancaster.—The company has filed a mortgage for $300,000 in favor of Vice-President John P. Green, of the Pennsylvania, as trustee. The mortgage is given to secure the issue of a like amount of bonds, the proceeds of which will be used for improving the present line and constructing extensions.

East Tennessee, Virginia & Georgia.—At a meeting of the stockholders, held at Knoxville last week, the proposed issue of $6,000,000 improvement and equipment bonds was approved.

Elkhart & Western.—It has been decided to postpone the building of this road until the spring. The line has been surveyed from Elkhart to Mishawaka, Ind., 10 miles, and the right of way for the entire line obtained.

Evansville & Richmond.—At the election held in Jackson, Bartholomew and Ohio townships, in Columbus County, Ind., the proposal to vote a 2 per cent. tax to aid in the construction of the proposed road was defeated. It is now stated that the line will be built by way of Seymour.

Georgia Southern & Florida.—It is expected to have the road completed to Valdosta, Ga., on the Savannah, Florida & Western, and 150 miles south of Macon early in November. The location has been completed to Palatka, Fla., 153 miles from Valdosta. The road is at present in operation from Macon to Cordele, 65 miles, and tracklaying is completed beyond Tifton, on the Brunswick & Western, and 115 miles from Macon. T. J. James & Co. are the contractors for grading.

Grafton & Upton.—It is stated that work will soon be commenced on the proposed extension from Grafton Centre through Hopedale to Milford, Mass. This will give Milford a direct connection with Worcester.

Livermore Valley.—Charter filed in California to construct a road from Livermore, Alameda County, in a southeasterly direction to the property of the Livermore Mining Company, the estimated length of the road being ten miles. Of the capital stock $10,500 has been subscribed.

Long Island.—The company has completed a double track between Hinsdale and Mineola, 4 miles, and is now building a double track between Winfield and Whitestone Junction, 3 miles. The contractor is John H. Byrne. The four-mile extension from Locust Valley to Oyster Bay is in progress under Clark, O'Brien & Dwyer, contractors.

Los Angeles & Glendale.—Incorporated in California to build a road from Los Angeles to Glendale, Cal., a distance of 7, and to Pasadena, 11 miles. The capital stock is $200,000.

Mobile & Dauphin Island.—The company has filed a copy of a mortgage and deed of trust to the Central Trust Co., of New York. The mortgage is to secure the payment of an issue of 5 per cent. 40 year bonds, the proceeds to be used for the building and equipment of the road.

Nashville & Tellico.—The road is now completed the entire distance between Athens and Tellico, Tenn., 22 miles. McDonald, Shea & Co. were the contractors for grading, bridging, tracklaying, etc.

New Roads.—The town of Union, Me., has voted to issue $30,000 bonds to aid in the construction of a road from Union to Warren, on the Knox & Lincoln, a distance of eight miles. Mitchell & Spofford, contractors, have offered to build the road when $41,000 has been raised. The preliminary surveys have already been made.

Norfolk & Virginia Beach.—The preliminary survey has been made for the branch from Jackson, Va., to Princess Anne Court House, a distance of 18 miles. A short branch is now under construction from Virginia Beach to Ocean Grove, Va.

Northern Pacific & Manitoba.—The railroad troubles in Manitoba, it seems, are not yet over. The Canadian Pacific has prevented the crossing of its road by the Portage la Prairie extension of this road, which the government is building by placing engines on its track, a few miles from Winnipeg, where the crossing is to be effected. There is also a large armed force on guard. The injunction from the courts forbidding the construction of the crossing was dissolved on Wednesday, but the Canadian Pacific will, it is said, continue such obstructive tactics as it can. A very stout board fence has been erected at the proposed point of crossing.

Ohio Valley.—President Kelsey announces that within 90 days work will be begun on the extensions north from Henderson to Evansville, and south from Princeton to a point not yet decided upon. Surveys are now being made. The contract has already been let to the Central Construction Co., of Henderson, Ky.

Paducah & Hickman.—Chief Engineer Postlewaite last week placed a corps of surveyors in the field locating the line, beginning at Paducah, Ky.

Port Jervis, Monticello & New York.—The extension from Hugenot to Summitville, N. Y., a distance of 18 miles, has now been all graded, and tracklaying is in progress from both points. At Summitville the road will connect with the New York, Ontario & Western.

Port Townsend Southern.—Grading is now in progress on this road, and it is expected to have 20 miles completed for tracklaying next spring. The road is being built South from Port Townsend, Wash. Ter., toward Portland. The survey has been completed for over 70 miles.

Richmond, Nicholasville, Irvine & Beattyville.—The stockholders have ratified the contract with the Ohio Valley Improvement & Contract Co., of Louisville, Ky., to build the road, stations, etc., for $2,400,000. This stipulates the road from Versailles, on the Cincinatti Southern, to Beattyville, in Lee County, Ky.

St. Paul, Minneapolis & Manitoba.—A dispatch from Duluth states that a corps of engineers has commenced a survey from a point on the Eastern Minnesota road, about 25 miles from West Superior, and thence northwest toward Winnipeg. This will follow the general route of the proposed Duluth & Winnipeg.

San Antonio & Aransas Pass.—The grading on the extension to Houston, Tex., from Wallis, has been finished between the connection with the Gulf, Colorado & Santa Fe in Houston and the Brazos River. Tracklaying will soon be completed.

Summit County Railroad & Transportation Co.—Articles of incorporation filed in Utah to build a road to begin at Coalville and extend through Summit County and to the southwest corner of Wyoming Territory. The cost of constructing the road is estimated at $800,000, and the capital stock of the corporation is placed at $1,000,000.

Tennessee & Ohio.—This railroad was sold Saturday, Oct. 20, by H. S. Aiken, the former owner, to E. J. Sanford for $150,000. The road runs from Rogersville Junction to to Rogersville, Tenn., and is about 16 miles long.

Western of Alabama.—The company has filed for record in the Probate Office of Montgomery County, Ala., a mortgage for $1,543,000, to the Metropolitan Trust Co., of New York. The mortgage was made to meet the following bonds: $372,000 of the first mortgage bonds of the issue of Oct. 1, 1868, and due Oct. 1, 1888. (This issue was $600,000, but the Central Railroad & Banking Co., of Georgia, has assumed the payment of $228,000) $1,171,000 of the second mortgage for $1,200,000, dated Sept. 15, 1870, and due Oct. 1, 1890, $29,000 having been paid off.

West Shore.—In the case of the United States Trust Co., of New York, against the New York, West Shore & Buffalo Co. and others, Abram S. Cassidy, the Referee, presented his final report for confirmation in the Supreme Court at Newburgh, N. Y., this week, and asked or instructions as to the payment of the balance of money remaining in his hands, amounting to about $127,000, and also asked for his discharge. Ashbel Green appeared for the Reorganization Committee, and as Receiver of the North River Construction Co. The Court made an order for the disposition of the moneys and the discharge of the referee. Referee Cassidy was appointed three years ago, and has been much delayed by litigations, accounts with other companies, and the failure of many of the bond-holders to present their bonds for the payment of the percentage fixed by the Court. Out of $50,000,000 of bonds of the old company, all have been presented to him but $54,000, and the referee will deposit money with the trust company to pay the percentage due on them when they are presented.

West Stockbridge.—This road is now controlled entirely by the Housatonic, that company having purchased the controlling interest formerly held by the Boston & Albany.

Williamstown & Delaware River.—The extension from Glassboro to Mullica Hill, N. J., seven miles, has been completed for a distance of five miles, from Glassboro to Jefferson, a point on Mullica Hill.

Wilmington & Weldon.—The Scotland Neck extension has been graded from Scotland Neck to Bethel, N. C., on the Albemarle & Raleigh, and track laying is in progress. The contract for completing it to Greenville has been let.

Wyoming & Eastern.—The company has filed at Laramie City, Wyo., a copy of a first mortgage in favor of the Manhattan Trust Co., of New York, for bonds to the amount of $20,000 per mile for the construction of a standard gauge road to commence at the eastern terminus of the Salt Lake Valley & Eastern, on the Utah boundary line, and pass easterly through the counties of Uintah, Sweetwater, Fremont, Carbon, Albany, Converse and Laramie in Wyoming Territory.

TRAFFIC AND EARNINGS.

Traffic Notes.

Messrs. Midgely and Faithorn have held a conference in New York with Commissioner Fink and representatives of the Central Traffic Association, and it is reported that an amicable arrangement has been arrived at concerning the percentages to be allotted to the lines east of the Mississippi River on business to and from points between Mississippi and Missouri rivers. Slight differences concerning these divisions have caused some disturbance for a long time. The joint rate committee, composed of the chairmen of the Trunk lines, Central Traffic, and two divisions of the Western Freight Association, is reinstated.

The Chattanooga Board of Health has discontinued its inspection of passengers. The quarantine against Jackson, Miss., has been raised, and most of the towns in Tennessee and northern Alabama which have maintained quarantines against all points have been thrown open. Decatur, Ala., is, however, still closed.

The Southern Pacific has followed the Union Pacific in placing on its through trains a regular service of second-class sleeping cars furnished with bedding, etc., and accompanied by a porter. They are run daily between San Francisco and El Paso. It is said that these cars are patronized every day, and often secure larger loads than do the Pullmans.

The Chicago & Northwestern has proposed to its neighbors the issuing of 5,000-mile tickets for joint use, similar to to those of the Lake Shore & Michigan Southern, which are now accepted on more than 20 roads. It is said the Burlington and the Rock Island have signified a willingness to enter into an arrangement of this kind.

A car-load of raisins has been shipped from Fresno, Cal., to London. The rate on the shipment to New York is said to have been $1.40 per 100 lbs.

The members of the Arkansas Lumbermen's Association report that their business is seriously crippled by the shortage of freight cars. At a meeting of the association in Little Rock, Secretary Trump reported that 1,500 cars were needed along the Iron Mountain line in Arkansas for the movement of lumber. He also found considerable complaint about motive power, which the railroad was unable to supply promptly. The accounts of the shortage given by members were all in one vein. D. H. Barnes was short of cars during the months of July and August. The scarcity was temporarily supplied, but since Oct. 1 was short 40 cars. C. E. Ferguson had a fair run of cars last month, but could not get enough to ship orders for lumber. L. W. Brower complained that the supply had been fair until the first of the month, but since then they were 50 cars short for moving timber at Prescott. R. C. Maupin at Dexter has had a fair supply up to the first of the month, but like a great many others, cars had been scarce during this month. T. P. Hearne said the car supply for last month was fair, but since the first of the present month they were 40 cars short and far behind on orders on that account. G. S. Henderson reported 75 cars short for this month. J. H. Trump reported 25 cars short at Malvern for the removal of timber in October business. G. H. Van Etten made a like complaint. D. H. Barnes said that his company could not take any more orders for lumber, unless the railroad furnished more cars at once. Mr. Henderson complained that at his mill 10 cars loaded with cross-ties remained on the side track for a week before they were removed, while he had asked time and again for cars to ship lumber.

Dispatches of Oct. 24 report that Chief Arthur of the Engineers, Grand Master Sargent of the Fireman's Brotherhood, and a representative of the Switchmen's and Brakemen's unions had signed articles of federation of the four organizations, and Mr. Arthur is reported to have expressed himself in favor of such a federation; but we have no authentic confirmation of either report.

The Inter-state Commerce Commission.

The Commission issued an order on Oct. 22 upon the roads comprising the Southern Railway & Steamship Association, directing them to appear before the Commission in Washington on Dec. 18 for an investigation of their tariffs and classifications. The order is based upon an inspection of the tariffs and classifications, and upon information and complaint filed, from which it appears that the roads in many cases violate the long and short haul section of the law; that the rates actually charged to shippers are not the rates given upon their schedules, but so-called combination rates are made; and that special tariffs are issued upon single shipments and are limited in time. The following are the roads named in the order:

Atlanta & West Point; Central of Georgia; Charleston & Savannah; Charlotte, Columbia & Augusta; Cincinnati, New Orleans & Texas Pacific; Columbia & Greenville; East Tennessee, Virginia & Georgia; Georgia; Louisville & Nashville; Memphis & Charleston; Mobile & Girard; Mobile & Montgomery; Montgomery & Eufaula; Nashville, Chattanooga & St. Louis; Norfolk & Western; Port Royal & Augusta; Richmond & Danville; Rome; Savannah, Florida & Western; Savannah, Griffin & North Alabama; Seaboard & Roanoke; South Carolina; South & North Alabama; Vicksburg & Meridian; Western & Atlantic; Western of Alabama; Wilmington & Weldon; Wilmington, Columbia & Augusta.

In the case of the Detroit Board of Trade and the Detroit Merchants and Manufacturers' Exchange against the Grand Trunk and the New York Central & Hudson River the Commission, opinion by Commissioner Bragg, has dismissed the petition. The Commission decided that the estimated percentage of a through rate between intermediate points on long hauls from the Northwest to seaboard or New England points, or vice versa, was not a fair standard of comparison with the rates on freight originating at and destined to such intermediate points, and also that rates at Detroit are relatively fair.

Chicago Car Service Association.

The following dispatch from Chicago, of Oct. 24, gives particulars concerning the car service association referred to in the discussion at the Time Convention two weeks ago: "The General Managers of the Chicago roads met Oct. 24 and practically completed the organization of the Chicago Car Service Association, the chief object of which is mutual protection against the abuses that have risen from a lack of proper demurrage regulations. Twenty-one roads are included in the membership, and an agreement covering the

whole subject has been adopted. This agreement provides that a per diem charge shall be made for delays of cars and the use of track in the city of Chicago and at junctions within 20 miles of the city, after 48 hours from the time of delivery of cars on the track for loading or unloading, not including Sundays or holidays, of $1 per car minimum charge. If, however, any road shall of itself desire to charge more than the sum named it may notify the Chairman, who shall enforce any charge the road may direct on the cars on its tracks. The delivery of cars shall be considered to have been effected either when such cars have been placed on a designated and recognized delivery track or when the road offering the cars would have delivered them had the track permitted.

"An Executive Committee of five members is to have full power to decide all questions which may arise under the agreement, its decisions to stand until overruled by the association. No railroad will be allowed to hold any freight for Chicago outside the territory embraced in the agreement, unless it be done in good faith and to avoid a blockade of freight at Chicago. Any road doing this for the purpose of avoiding the charges for detention of cars will be considered as having violated the terms of the contract, and will be liable to a fine. For each violation of this agreement a penalty of $500 is to be paid by the company at fault. This agreement becomes effective Nov. 1."

Transcontinental Rates.

Chairman Leeds, of the Transcontinental Association, after visiting Washington, announced last week in Chicago that the numerous commodity rates to the Pacific Coast from Chicago and other interior points, which were yet complained of by Chicago merchants, would be discontinued. It appears that the Inter-state Commerce Commissioners have examined the tariffs and expressed the opinion that they are illegal, because they discriminate against individuals and localities. It is announced that from Oct. 23 the regular tariff will go into effect on this business on all the roads leading from Chicago westward. By this the freight rates to the Pacific Coast will be the same from all billing points between New York and the 97th meridian (Omaha).

Freight Rates in the Northwest.

The Minneapolis, St. Paul & Sault Ste. Marie has come to an agreement with the other lines and will advance rates to the East on Oct. 28 both by all-rail and lake-and-rail 2½ cents.

The Duluth, South Shore & Atlantic, which has just opened for through business from Duluth eastward, has made the following west-bound freight rates via the Central Vermont, Canada Atlantic and Canadian Pacific: New York to Duluth, $1.10, 99, 77, 51, 44, 36.

It understood that eastbound rates are to be the same, putting Duluth on an equality with St. Paul and Minneapolis.

The Northern Pacific has announced a reduction of about 13 per cent. in freight rates between St. Paul and Winnipeg over the Northern Pacific & Manitoba, which this road has just assumed control of. The new rates are $1.16, 98, 80, 66, 57, 47, 35, 35, 35, 27

East-bound Shipments.

The shipments of east-bound freight from Chicago by all lines for the week ending Saturday, Oct. 20, amounted to 64,070 tons, against 62,039 tons during the preceding week, an increase of 2,031 tons, and against 44,038 tons during the corresponding week of 1887, an increase of 20,032 tons. The proportions were:

Lines.	P. c.
Wabash	9.0
Michigan Central	10.1
Lake Shore & Mich. S.	14.8
Pitts., Ft. Wayne & C.	15.0
Chic., St. L. & Pitts.	13.7
Baltimore & Ohio	4.4
Chicago & Grand Trunk	14.2
N. Y., Chic. & St. L.	7.2
Chicago & Atlantic	11.6
Total	100.0

Of the above shipments, 3,624 tons were flour, 26,736 tons grain, 2,837 tons cured meats, 2,374 tons lard, 7,958 tons dressed meats, 1,020 tons butter, 1,969 tons hides, 686 tons wool, and 3,698 tons lumber. The two Pennsylvania lines carried 28.7 per cent. of the shipments, while the three Vanderbilt lines carried 32.1 per cent.

Coal.

The coal and coke tonnage of the Pennsylvania originating on lines east of Pittsburgh and Erie for the week ending Oct. 13, and the year to that date, was as follows:

	Coal.	Coke.	Total.
Total for week ending Oct. 13, '1888	225,101	87,326	312,427
Total for year 1888 to date	9,101,422	3,092,586	12,194,008
Total for year 1887 to date	8,007,803	2,786,000	10,793,803

The anthracite coal tonnage of the Belvidere division of the United Railroads of New Jersey division for the same periods was as follows:

	1888.	1887.	Inc. or Dec.
Total for week	30,130	33,283	D. 3,152
Total for year	1,276,992	1,247,259	I. 29,733

The coal tonnage for the week ending Oct. 20 is reported as follows, in tons:

	1888.	1887.	Increase.	P. c.
Anthracite	968,540	728,391	240,149	32.9
Bituminous	323,010	292,461	30,549	10.4

The Cumberland coal trade for the week ending Oct. 23 amounted to 72,515 tons, and for the year to that date 2,867,949 tons.

Cotton.

The cotton movement for the week ending Oct. 19 is reported as follows, in bales:

Interior Markets;	1888.	1887.	Inc. or Dec.	P. c.
Receipts	176,901	190,697	D. 13,796	7.2
Shipments	141,597	140,577	I. 1,020	.7
Stock	174,971	229,700	D. 54,729	23.8
Seaports:				
Receipts	263,263	271,799	D. 8,536	3.2
Exports	123,659	176,848	D. 53,189	30.1
Stock	515,913	580,945	D. 65,032	11.2

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

Nine Months—Jan. 1 to Sept. 30:

	1888.	1887.	Inc. or Dec.	P.c.
Atlantic & Pacific	$2,053,160	$1,934,869	I. $118,291	6.1
Buff., Roch. & Pitts.	1,396,733	1,574,738	D. 178,005	11.2
*Bur., Ced. Rap. & N	1,356,403	1,992,978	D. 136,575	6.9
Cario, Vin. & Ohio	532,970	557,884	D. 24,914	4.5
Canadian Pacific	9,350,483	7,904,469	I. 1,446,014	18.3
Cape F. & Yad. Val.	231,844	193,723	I. 38,121	19.7
Central of Iowa	995,722	950,749	I. 44,973	4.7
*Chesapeake & Ohio.	3,234,724	3,159,982	I. 74,742	2.4
Ches., Ohio & S. W.	1,425,240	1,366,679	I. 58,561	4.3
Chicago & Atlantic	1,613,668	1,615,034	D. 1,366	.1
Chi. & East Ill.	1,540,796	1,482,598	I. 58,198	3.9
Chi. & Ind. Coal	375,971	292,757	I. 83,214	5.6
Chi., Mil. & St. Paul.	17,032,000	17,407,448	D. 375,448	2.2
Chicago & Ohio R.	42,755	51,766	D. 9,011	17.4
Chi., St. P. & K. C.	1,599,404	1,123,928	I. 475,476	42.3
Chi. & W. Mich.	1,044,775	1,036,765	I. 8,010	.8
Cin., Jack. & Mack.	387,892	341,766	I. 46,126	13.5
Cin., N., O. & Tex. P.	2,674,623	2,426,796	I. 247,827	10.2
Ala. Gt. South	1,098,322	1,098,372	D. 50	....
N. O. & North East	595,121	462,249	I. 132,872	28.7
Vick. & Mer.	314,862	364,254	D. 49,392	13.6
Vick., Sh. & Pac.	357,114	369,762	D. 12,648	3.4
Cin., Rich. & Ft. W.	300,519	306,972	D. 6,453	2.1
Cin., Wash. & Balt.	1,541,820	1,597,958	D. 56,138	3.5
*Cleve., Akron & Col.	467,639	403,061	I. 64,578	16.0
Cleve. & Marietta	201,686	220,435	D. 18,749	8.5
Col. & Cin. Midland.	271,255	238,345	I. 32,910	13.9
Col., Hock. V. & Tol.	2,189,893	1,995,148	I. 194,745	9.8
Denver & Rio Grande	5,642,991	5,721,292	D. 78,301	1.4
Den. & Rio G. W.	953,122	820,801	I. 132,321	15.1
Det., Lansing & No.	743,821	848,289	D. 104,468	12.3
East Tenn., Va. & G.	4,036,435	3,755,349	I. 281,086	7.5
Evansville & Ind.	179,372	175,715	I. 3,657	2.0
Evans. & T. Haute	636,528	641,858	D. 115,330	17.9
Flint. & Pere. Mar.	1,799,251	1,928,188	D. 128,937	6.7
*Georgia Pacific	861,857	823,041	I. 38,816	4.7
Gr. Rapids & Ind.	1,677,669	1,771,092	D. 93,423	5.2
Other lines	146,690	119,828	I. 26,862	22.5
†Grand Trunk of Can.	13,369,518	14,410,963	D. 1,041,445	72.3
Houston & Tex. Cen.	1,738,821	1,814,320	D. 75,499	4.2
Humeston & Shen.	106,708	111,922	D. 5,214	4.7
Ill. Cen. (Ill. & So. Div.)	8,389,036	8,262,310	I. 126,726	1.5
Cedar Falls & Minn	71,667	85,873	D. 14,206	16.5
Dubuque & S. C.	596,653	591,594	I. 5,059	.8
Iowa Falls & S. C.	574,233	487,880	I. 86,353	17.7
Ind., Dec. & Western.	269,059	312,626	D. 43,567	13.9
Kanawha & Ohio	202,959	128,847	I. 74,112	57.5
*Kan. C., Ft. S. & M.	2,979,223	3,337,737	D. 358,514	10.7
*Kan. C., Clin. & Sp.	190,282	181,338	I. 8,944	4.9
*Keokuk & Western.	223,747	231,013	D. 7,266	3.1
Kingst. & Pembroke.	145,212	123,122	I. 22,090	17.9
Lehigh & Hudson	185,653	183,758	I. 1,895	1.0
*Little Rock & Mem.	471,489	541,068	D. 69,579	12.9
Long Island	2,671,406	2,525,216	I. 146,190	5.8
Louis., Evan. & St. L.	688,957	737,584	D. 48,627	6.6
Louis. & Nashville	11,850,545	11,551,330	I. 299,215	2.6
Louis., N. Alb. & Chi.	1,651,164	1,658,959	D. 7,795	.5
Louis., N. O. & Tex.	1,580,804	1,351,501	I. 229,303	16.9
Mar., Col. & N.	63,695	49,012	I. 14,683	29.9
Memphis & Charles.	1,118,424	1,180,625	D. 62,201	5.2
‡Mexican Central	4,171,545	3,434,219	I. 737,326	21.4
*†Mexican Railway.	2,781,529	2,639,776	I. 141,753	5.3
Mil., L. Sh. & West.	2,063,630	2,473,690	D. 410,060	16.6
Minn. & St. Louis	970,625	1,071,273	D. 100,648	9.4
Mo., Kansas & Tex.	4,552,706	5,461,900	D. 909,194	16.6
Int. & Gt. Northern	2,131,722	2,211,528	D. 79,806	3.6
Mobile & Ohio	1,727,434	1,763,316	D. 35,882	2.0
N. Y. C. & H. R.	26,096,633	26,275,709	D. 179,166	.6
N. Y., Ont. & West.	1,286,846	1,153,455	I. 133,391	11.6
Norfolk & Western.	3,561,282	2,976,813	I. 584,469	19.6
Northern Pacific	12,352,746	9,357,525	I. 2,995,221	32.0
Ohio & Mississippi	2,795,289	3,031,981	D. 236,692	7.8
Ohio River	342,136	255,045	I. 87,091	34.1
Ohio Southern	401,730	411,488	D. 9,758	2.4
Ohio Valley of Ky.	96,294	64,700	I. 31,594	48.8
Peoria, Dec. & Evans	508,223	635,687	D. 127,464	20.1
Pittsburg & Western.	1,459,883	1,480,280	D. 20,397	1.4
Rich. & Danville	3,232,590	3,036,154	I. 196,436	6.4
Va. Midland Div.	1,337,793	1,220,852	I. 116,941	9.6
Charl., C. & A. Div.	632,124	581,678	I. 50,446	8.7
Col. & Greenv. Div.	417,228	363,115	I. 54,113	14.9
Western N. C. Div.	456,873	517,401	D. 60,528	11.6
Wash., O. & W. Div	89,939	88,427	I. 1,512	1.7
Ashev. & Spar. Div	81,200	49,056	I. 32,144	65.4
St. L., A. & T. H. Br.	661,860	673,847	D. 11,987	1.8
St. L., Ark. & Tex.	2,069,618	1,707,025	I. 302,593	17.7
St. L. & San Fran.	4,064,868	4,437,148	D. 372,280	8.4
St. Paul & Duluth	1,122,222	1,187,683	D. 65,461	5.5
San A. & Aran. Pas.	709,338	356,472	I. 352,866	99.0
Staten Island Rap. T.	743,480	690,864	I. 52,616	7.6
Texas & Pacific	4,377,582	4,028,434	I. 349,148	8.6
Tol. & Ohio Central.	856,245	753,649	I. 102,596	13.6
Tol., Peoria & West.	646,714	692,980	D. 46,266	6.6
Valley of Ohio	492,274	462,406	I. 29,868	6.3
Wabash Western	4,183,954	4,747,324	D. 563,370	11.9
West N. Y. & Penn.	2,338,407	2,055,526	I. 282,881	13.7
Wheeling & Lake E.	643,594	544,276	I. 99,318	18.2
Wisconsin Central	2,773,869	2,723,596	I. 50,273	1.8
Total	$219,716,410	$214,551,924	I. 5,164,486	2.4

Twelve Months—Oct. 1 to Sept. 30:

Baltimore & Ohio:					
Lines east of Ohio.	15,659,124	16,042,003	D.	382,879	2.4
Net	5,439,191	5,632,974	D.	193,783	3.4
Lines west of Ohio.	4,702,554	4,617,033	I.	85,521	18.5
Net	610,760	905,930	D.	295,170	32.5
Total system	20,361,678	20,658,036	D.	296,358	14.4
Net	6,049,951	6,538,904	D.	488,953	7.5
Rich. & W. P. T. Ry. & W. Co.:					
Rich & Danville	4,718,928	4,299,662	I.	419,266	9.7
Net	2,216,476	1,983,822	I.	232,654	11.7
Virginia Mid. Div.	1,770,677	1,605,917	I.	164,760	10.2
Net	732,634	620,535	I.	112,099	18.1
Char., C. & A. Div.	914,815	826,115	I.	88,700	10.7
Net	390,806	335,508	I.	55,298	16.5
Columbia & G. Div.	621,074	559,468	I.	61,606	11.0
Net	217,940	129,423	I.	88,517	68.4
West. No. C. Div.	629,379	660,600	D.	31,221	4.7
Net	99,639	92,022	I.	7,617	8.3
Total five roads	8,654,872	7,951,762	I.	703,110	8.9
Net	3,657,494	3,161,310	I.	496,184	15.6
Staten Isl. Rap. Tr.	907,760	842,279	I.	65,481	7.8
Net	277,150	223,859	I.	53,291	23.8

Eight Months—Jan. 1 to Aug. 31:

Atch., Top. & S. F.	9,827,142	12,129,912	D.	2,302,770	19.0
Net	2,917,059	5,561,141	D.	2,644,082	47.5
Carolina Central	321,136	296,631	I.	24,505	8.3
Net	94,543	76,155	I.	18,388	24.2
Chesapeake & Ohio.	2,943,275	2,864,551	I.	78,724	2.8
Net					
Cin., I., St. L. & C.	1,700,571	1,737,564	D.	36,993	2.1
Net	634,606	672,142	D.	37,536	5.6
Denver, So. P. C. & P.	725,553	852,030	D.	126,477	14.8
Net	def. 35,329	54,724	D.	90,053	....
Ft. W. & Den. City	639,480	426,656	I.	212,824	49.0
Net	236,065	174,741	I.	61,324	35.1
Grand Trunk of Can.	11,509,217	12,388,949	D.	879,732	7.1
Net	3,241,040	3,837,594	D.	596,554	15.5
Louisv., N. Alb. & C.	1,447,287	1,456,005	D.	8,718	0.6
Net	486,834	415,971	I.	70,863	17.0
Mexican Central	3,821,516	3,066,274	I.	755,242	24.6
Net	1,464,224	1,351,571	I.	112,653	8.3
Oregon Short Line	1,650,878	1,292,337	I.	358,541	27.7
Net	740,955	421,270	I.	319,685	75.9
Rome, W. & Ogd.	2,152,276	2,025,145	I.	127,137	6.3
Net	880,430	857,302	I.	23,128	2.7
Scioto Valley	427,621	501,931	D.	74,310	14.8
Net	74,877	114,468	D.	39,591	34.6
Seaboard & Roanoke	404,118	357,493	I.	46,625	13.0
Net	122,321	111,895	I.	10,426	9.0
Southern Pacific Co.:					
Gal., Har. & S. Ant.	2,425,965	2,090,461	I.	335,504	16.0
Net	547,703	297,120	I.	245,583	83.0
Louisiana West.	606,914	534,900	I.	72,014	13.4
Net	286,657	247,886	I.	38,771	15.6
Morgan's La. & T.	3,131,079	2,579,069	I.	552,010	21.4
Net	884,678	458,325	I.	426,353	93.0
N. Y., Tex. & Mex.	77,663	107,798	D.	30,135	28.0
Net	def. 38,997	7,970	D.	46,967	....
Tex. & New Or.	910,689	807,929	I.	102,760	12.7
Net	239,894	371,360	D.	131,466	35.9
Tot. Atlan. System.	7,152,307	6,120,155	I.	1,032,152	16.8
Net	1,919,934	1,382,662	I.	537,272	38.8
Total Pac. System.	22,795,326	17,960,421	I.	4,834,905	27.1
Net	8,165,669	8,151,557	I.	14,112	0.2
Total of all.	29,947,634	24,080,577	I.	5,867,057	24.3
Net	10,085,605	9,534,220	I.	551,385	5.8
Wabash	4,128,232	4,424,568	D.	296,336	6.7
Net	726,025	1,499,475	D.	773,450	51.6

Month of September:

	1888.	1887.	Inc. or Dec.	P.c.
Baltimore & Ohio:				
Lines east of Ohio.	$1,391,180	$1,617,085	D. $225,905	13.9
Net	557,775	732,280	D. 174,505	23.8
Lines west of Ohio.	410,394	437,600	D. 27,206	6.2
Net	101,994	169,513	D. 67,519	39.9
Total system	1,801,574	2,054,685	D. 253,111	12.3
Net	659,769	901,793	D. 242,024	26.8
Cape F. & Yad. Val.	27,560	28,637	D. 1,077	3.8
Net	12,187	14,329	D. 2,142	15.0
Nash., Chat. & St. L.	271,179	270,148	I. 1,031	.4
Net	108,550	121,404	D. 12,854	10.5
Prest. & Ariz. Cen.	10,137	6,831	I. 3,306	48.6
Net	6,391	3,782	I. 2,609	68.6
R. & W. P. T. Ry & W. Co.:				
Rich. & Danville	368,778	430,583	D. 61,805	14.3
Net	174,142	221,930	D. 47,788	21.5
Va. Mid. Div.	175,863	172,776	I. 3,087	1.7
Net	74,333	89,104	D. 14,771	16.5
Cha., Col. & A. Div	62,153	86,931	D. 24,778	28.5
Net	23,872	39,620	D. 15,748	38.2
Col. & G. Div.	42,427	50,726	D. 8,299	16.4
Net	230	4,682	D. 4,452	94.8
West. No. C. Div.	55,726	68,555	D. 12,829	18.7
Net	8,404	12,262	D. 3,858	31.3
Total five roads	704,946	809,571	D. 104,625	12.8
Net	280,980	367,598	D. 86,618	23.6
Staten Isl. Rap. Tr.	97,017	92,387	I. 4,630	5.0
Net	40,338	40,612	D. 274	.7
Summit Branch	132,045	125,634	I. 6,411	5.1
Net	23,263	13,484	I. 9,779	72.4
Lykens Valley	75,305	90,587	D. 15,282	16.8
Net	283	9,189	D. 8,906	96.8

Month of August:

Atchison, T. & S. F.	1,318,744	1,501,376	D.	182,632	12.1
Net	448,553	688,279	D.	239,746	34.8
Carolina Central	42,208	36,020	I.	6,188	17.2
Net	16,561	8,805	I.	7,756	88.1
Chesapeake & Ohio.	408,890	415,359	D.	6,469	1.5
Net	156,380	123,487	I.	32,893	26.6
Cin., Ind., St. L. & C.	241,876	337,453	D.	95,577	28.2
Net	91,358	97,863	D.	6,505	6.6
Den., So. C. & Pac.	105,137	131,856	D.	26,719	20.2
Net	9,862	37,682	D.	27,820	73.2
Ft. Worth & Den. C.	109,225	68,039	I.	41,186	60.5
Net	43,058	33,883	I.	9,175	27.1
Grand Trunk of Can.	1,665,710	1,781,386	D.	115,676	6.5
Net	485,792	564,715	D.	78,923	13.8
Chi. & Grand Tr.	258,855	289,073	D.	30,218	10.5
Net	55,669	76,905	D.	21,296	27.6
Det., Gr. H. & Mil.	108,187	110,773	D.	2,586	2.3
Net	35,000	34,888	I.	112	.3
Louis., New Alb. & C	226,844	218,782	I.	8,062	3.7
Net	95,539	100,101	D.	4,562	4.6
Mexican Central	453,785	374,117	I.	79,655	20.7
Net	180,646	154,612	I.	26,034	16.8
Guadalajara Div.	44,846				
Net	23,686				
Oregon Short Line.	253,008	195,651	I.	59,357	29.4
Net	132,167	90,157	I.	42,010	46.4
Rome, Water. & Ogd.	353,362	347,774	I.	5,588	1.6
Net	174,393	180,905	D.	6,512	3.6
Scioto Valley	62,647	78,585	D.	15,938	20.2
Net	18,693	27,414	D.	8,721	31.8
Seaboard & Roanoke	46,346	44,599	I.	1,747	3.9
Net	14,230	13,179	I.	1,051	8.0
Southern Pac. Co.:					
Gal., Har. & S. Ant.	305,072	280,064	I.	25,008	8.9
Net	75,872	88,752	D.	12,880	14.5
Louisiana West.	90,493	82,484	I.	8,009	9.7
Net	48,948	44,886	I.	4,062	9.0
Morgan's La. & Tex.	358,041	339,662	I.	18,379	5.4
Net	95,481	92,145	I.	3,336	3.6
N. Y., Tex. & Mex.	15,215	15,735	D.	520	3.3
Net	def. 1,251	5,521	D.	6,772	....
Tex. & N. Orleans.	137,017	121,054	I.	5,963	4.9
Net	52,533	66,282	D.	13,749	20.7
Tot. Atlan. System.	905,839	838,999	I.	66,840	8.0
Net	271,582	297,586	D.	26,004	8.7
Tot. Pacific System	3,245,784	2,877,580	I.	368,204	12.8
Net	1,284,034	1,527,776	D.	243,742	15.9
Total of all.	4,151,623	3,716,579	I.	435,044	11.7
Net	1,555,616	1,825,362	D.	269,746	14.7
Wabash	704,267	703,158	I.	1,109	.2
Net	220,645	264,980	D.	44,335	16.7

Nine Months—Jan. 1 to Sept. 30:

Cape Fear & Yad Val	231,850	193,723	I.	38,127	19.5
Net	103,562	91,049	I.	12,513	13.7
Nash., Chat. & St. L.	2,295,963	2,255,786	I.	40,177	1.7
Net	939,180	1,017,156	D.	77,976	7.7
Prescott & Ariz. Cen.	90,936	66,936	I.	24,000	35.9
Net	61,678	39,490	I.	22,188	56.2
R. & W. P. T. Ry. & W. Co.:					
Rich. & Danville	3,197,318	3,027,310	I.	170,008	5.6
Net	1,384,627	1,356,436	I.	28,191	2.1
Va. Mid. Div.	1,360,756	1,228,328	I.	132,428	10.8
Net	571,902	506,746	I.	65,156	12.8
Char., Col. & A. Div.	626,007	581,678	I.	44,329	7.6
Net	228,573	209,502	I.	19,071	9.1
Col. & G. Div.	420,255	363,115	I.	57,140	15.7
Net	129,575	36,532	I.	93,040	...
West. No. & C. Div.	463,999	517,401	D.	53,402	10.3
Net	72,827	73,414	D.	5,870	8.0
Total five roads	6,068,405	5,717,832	I.	350,573	6.1
Net	2,387,504	2,182,630	I.	204,874	9.4
Staten Isl. Rap. Tr.	743,134	690,865	I.	52,269	7.6
Net	244,584	200,911	I.	43,673	22.7
Summit Branch	1,089,935	915,818	I.	174,137	19.0
Net	158,493	17,637	I.	140,856	...
Lykens Valley	749,587	508,108	I.	241,479	47.5
Net	def. 21,781	def. 136,839	I.	115,058	...

* Includes three weeks of September in each year.
† To Sept. 29.
‡ Mexican currency.

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

ANNUAL REPORTS.

The following is an index to the annual reports of railroad companies which have been reviewed in previous numbers of the current volume of the *Railroad Gazette:*